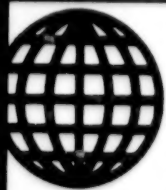


PRS-TND-89-015

8 JULY 1989



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## ***JPRS Report***

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# **Nuclear Developments**

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# Nuclear Developments

JPRS-TND-89-015

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28 JULY 1989

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## SOUTH AFRICA

### **Chip-Based System for Detonator Sequence Noted** *34000570n Johannesburg BUSINESS DAY in English* *1 Jun 89 p 10*

[Text] One of the first high-tech developments of its kind in SA [South Africa] which has been done on a purely commercial basis—as opposed to being strategically motivated—is soon to reach the market.

The Expert Explosives' Rock Star blasting system is designed to address the problems of conventional blasting and centers on a chip-based computer-controlled system.

Developed over the past 18 months by AECI subsidiary Export Explosives, the captive market for the detonators is huge, set at about 250-million a year in SA alone and some 2.5-billion worldwide—as large as the world's total digital watch market.

Although the cost of existing detonators is about R1 apiece, the Rock Star detonators will cost about R4 when they are being made in large quantities. However, Expert Explosives' MD Viv Patz explains that there are key advantages for which users will be prepared to pay a premium.

"Existing detonators work on the premise that blasts will take place in the right sequence. However, this is not always the case, since pyrotechnic fuse is used as a sequencing element.

"There is at present no way of testing detonators to ensure that they are working, so misfires occur fairly frequently," explains Patz. Out of sequence shots result in badly broken working mining faces.

"With our system, each detonator is tested in turn, and faults are shown on the computer before blasting starts. Wiring errors are also tested prior to any blasting," he says.

One type of detonator is used to achieve delays on one-millisecond to 10-seconds in one-millisecond steps. It is widely believed that if blasters can sequence their blasts to take place in order of milliseconds, then detonators can cause blasts to reinforce one another. But, to date, it has been night impossible to test this theory.

However, ICI has been making electronic detonators in an attempt to prove this, and initial findings show that millisecond blasting can indeed cause better fragmentation and better vibration control.

There is no escaping the fact that mining is the art of delivering broken rock where it is most needed and also in the right size pieces.

"Also, it's preferable that the hanging wall or roof is not damaged when blasting takes place. Millisecond blasting definitely assists in these three areas, because correct rock size is easier to obtain through sequencing, and roof damage can be avoided," says Patz.

Initial markets for the system include companies involved in imploding buildings, as well as those wanting to carry out ring blasting and open pit mining, where minimal vibration is the key.

Expert Explosives has attracted a significant number of SA's silicon designers to design the chips needed for the system, and while the chips are now being made in Germany, Pretoria-based SA Microelectronic Systems (Sames) will be approached to make them at a later stage. It is believed that just making 15 percent of the South African requirement for the chips could take up the entire production capabilities of Sames.

### **New Connectors**

The hand-held computer—or Blast Programmer—used for the system has also been locally developed and is already working. This can control four harnesses, each with up to 250 detonators.

The wiring for the wiring harness is being made by ATC, which is setting up a wire drawing machine for Expert Explosives' requirements, and the connectors are being developed by Technor-Molex, a subsidiary of Molex, one of the world's largest connector manufacturers.

"A special connector was essential to suit the mining application, and it is waterproof and rugged, with a patent pending in SA," Patz says.

It is expected that the first units will be sold from mid-1990, although field trials start this September.

### **Country's 'Space Race' Interest 'Commercial'** *34000568n Johannesburg THE STAR in English* *1 Jun 89 p 13*

[Article by Bruce Cameron]

[Text] Cape Town —South Africa is in the space race and could in the foreseeable be putting her own satellites into orbit.

At the moment, however, South Africa's participation in space is earthbound, although the SABC (South African Broadcasting Corporation) already owns a little bit of one of those chunks of high tech metal, ceramic and plastic hurtling around the world.

South Africa is also involved in space research, being for instance a leader in cosmic ray investigations, but the main thrust of interest in space is commercial exploitation.

At a press conference this week Minister of Economics and Technology, Mr Danie Steyn, made it clear that South Africa could not immediately afford to develop her own satellites.

### **Staged Involvement**

Mr Steyn, along with Dr Brian Clark, who headed a CSIR (Council for Scientific and Industrial Research) investigation into space development and Professor



H.C. Viljoen, chairman-designate of the SABC and Dean of Engineering at the University of Stellenbosch, said there would be a staged involvement which had already started.

The SABC, for instance, had started off renting transponders on satellites for transmitting material not only internationally but also internally.

Now the SABC owns two transponders and needs to own four to five, with the Post Office also needing a number for communication.

Transponders are on a satellite owned by the European company, Intelsat, in which South Africa has a four percent share.

The problem, however, is that the satellites have what is known as a very wide footprint. This means the satellite is often not in the correct position to transmit and also that the signal is not as precise as it could be.

Professor Viljoen said receiving dishes of two to three-meter parabola had to be used, whereas if the SABC had access to a satellite which had a footprint covering only South Africa, the receiver could be reduced to a half-meter parabola.

But more important than this, all the micro-wave towers and relaying radio masts could be scrapped. It would also increase the number of channels available for transmitting.

The SABC would be able to reach 100 percent of the country with signals being bounced up and back using what was called the direct broadcasting system (DBS).

M-Net could also take advantage, as it was far easier to permit or refuse access to subscribers.

Last year it cost the SABC R6 million to increase its television transmission area from 87 to 88 percent of the country by normal methods.

Professor Viljoen said, however, that other forms of transmission had to be considered, including the rapidly developing fibre optical system through which an amazing amount of communication signals could be sent.

South Africa's interest in space is overwhelmingly commercial, Mr Steyn said, with communication, data transmission and navigation being among the main objectives.

Little is said about other uses, although Mr Steyn said Armscor, a leader in technology, had been consulted.

The next step would probably be to construct her own satellite, although a launch vehicle was still a long way down the track.

There was no need to spend an enormous amount developing a launch system under current conditions.

At the moment, especially since the space shuttle has got back on track, there is plenty of capacity available for South Africa.

There are also no political obstructions to buying that space. Not only were the Americans supplying launch vehicles but so were the Europeans, Russians and Chinese.

Mr Steyn said the Government was well aware the country had to keep abreast of earth and spacebound space technology, particularly because of its many applications in other industries.

Dr Clark said South Africa had a "critical mass of highly experienced people" in most of the space technology disciplines, a number of whom had worked at the headquarters of exploration, Nasa, in the US.

South Africa was also involved in assisting other countries in their space programmes.

Mr Steyn said the Government would encourage various sectors to keep abreast of space technology and had appointed a "brains trust" to advise the Government on a continuous basis.

The trust consisted of the CSIR, the Industrial Development Corporation the Department of Posts and Telecommunications, the Weather Bureau, the Department of Trade and Industry, the SABC and the academic space research community.

The Government would also encourage more research.

Dr Clark pointed out that at the moment South Africa spend only 0,025 percent (about R4 million) of her Gross Domestic Product on space related projects, against the 0,5 percent in the United States and the Soviet Union.

**Sino-Foreign Nuclear Cooperation Unchanged**  
*HK1407044389 Hong Kong ZHONGGUO TONGXUN SHE in Chinese 0809 GMT 13 Jul 89*

[Report: "China's Plan for Foreign Cooperation in Nuclear Industry Will Remain Unchanged"—ZHONGGUO TONGXUN SHE headline]

[Text] Beijing, 13 Jul (ZHONGGUO TONGXUN SHE)—The guideline on the development of China's nuclear industry will not change and, in this regard, the country's open policy and cooperation plan will not change either, an official in charge from the China Nuclear Industry Corporation reiterated when interviewed by this reporter.

This official said: China will uphold its principle of active and appropriate development of nuclear power and will keep its goal to build nuclear power plants with a total generating capacity of 6 million kw.

He said, so far, the Daya Bay nuclear power plant in Guangdong is the largest Sino-foreign joint venture ever started in China, and this project has always been a focus of public attention. This project was not affected during the Beijing 4 June incident, and all 318 Chinese and foreign experts have been working in their posts as normal. The construction of the safety shell [an quan ke 1344 0356 8199] of the nuclear reactor is expected to be completed by 21 September. Equipment will then be installed and the nuclear power plant will go on stream as scheduled.

**Beijing Electron-Positron Collider Passes Appraisal**

*OW0507155189 Beijing XINHUA in English 1228 GMT 5 Jul 89*

[Text] Beijing, July 5 (XINHUA)—The Beijing electron-positron collider (BEPC), completed last October, passed the appraisal of specialists here today after having worked for 3,000 consecutive hours.

The high-energy accelerator, described as "one of the most important advances in recent years following China's successes in manufacturing atom bombs, hydrogen bombs and man-made satellites in China's science", is located in a six-meter-deep tunnel at the Institute of High Energy Physics of the Chinese Academy of Sciences.

The complex housing the collider contains a linear accelerator 200 meters in length, a 240-meter perimeter storage ring, a 400-ton Beijing spectrometer (BES), a synchrotron radiation laboratory and a computer center. Its purpose is to explore the fundamental structure of matter.

The great energy released, when a tremendous mass of positrons and electrons travel at the speed of light (about 300,000 kps) and collide with each other, is expected to help Chinese nuclear physicists study physics.

The Beijing spectrometer also passed the appraisal today. It is equipped in the interaction point of the BEPC to

detect the properties, interaction and kinetic law of basic particles when positrons and electrons collide.

Nine experts from Beijing University, Qinghua University, Chinese University of Science and Technology, and China Atom Energy Research Institute tested the BEPC and BES for their function at the end of last month and proved that the two machines' qualities have reached the 1980s' international standard.

In the construction of the BEPC and BES, Chinese scientists have not only introduced many advanced types of technology from abroad, they have also made their own contributions to collider technology.

National scientific labs in the United States, South Korea and Brazil are purchasing key collider equipment developed and manufactured by Chinese scientists and engineers.

Wang Ganchang, president of the appraisal committee, said: "Chinese scientists have a remarkable ability. They are able to master the world of advanced technology if they receive substantial financial support from the government."

**Shanghai Nuclear Equipment Industry Develops**  
*HK0607105689 Beijing ZHONGGUO XINWEN SHE in Chinese 0504 GMT 5 July 89*

["Industry To Manufacture and Process Nuclear Equipment Emerges in Shanghai"—ZHONGGUO XINWEN SHE headline]

[Text] Shanghai, 5 Jul (ZHONGGUO XINWEN SHE)—Shanghai, the city that has the most complete range of industries in China, has in recent years seen the rise of another new high-tech industry—the manufacturing and processing of nuclear equipment.

This new industry took its shape and developed in the process of constructing the Taishan Nuclear Power Plant—the first one designed and constructed by China itself.

At present, Shanghai is already capable of manufacturing nuclear island [he dao 2702 1497], or conventional island facilities, and various other auxiliary equipment for a nuclear power plant at the 300,000 or 600,000 KW level. Factories responsible for manufacturing this equipment come respectively from electromechanic, meter, metallurgical, ship building, chemical and various other industries; over a hundred factories are involved.

The State Bureau of Nuclear Safety and the International Atomic Energy Agency have conducted many strict inspections on the complicated and accurate equipment manufactured in Shanghai. The high quality of the products is thus ensured. Through importing and home research, Shanghai has also formulated and perfected a set of strict regulations and a corresponding system of

quality control. A close to 10,000-strong technical force engaged in manufacturing the nuclear equipment has also been developed.

At noon on the 3 July, the last major equipment made by Shanghai for the Taishan Nuclear Power Plant—an evaporator—was slowly pulled out of the Shanghai Boiler

Manufacturer for delivery. Up to this stage, the manufacturing by Shanghai of all the Taishan Nuclear Power Plant's major equipment has been completed and handed over for installation. It is understood that the major equipment includes a pressure stabilizer, two evaporators and in-pile components. All of the equipment is described as the nuclear island single-loop nerve center.

## JAPAN

### University Makes Breakthrough in Nuclear Fusion Research

OW1407141389 Tokyo KYODO in English  
1213 GMT 14 Jul 89

[Text] The Institute of Laser Engineering (ILE) of Osaka University, for the first time ever, has used a laser beam to compress fuel pellets or spherical plastic shell targets to a density necessary for causing nuclear fusion, institute officials say.

"Our success well attests to the plausibility of generating nuclear fusion using lasers, said a senior researcher of ILE.

The team's breakthrough could enable the research institute to take the lead in laser nuclear fusion, experts said.

Nuclear fusion is a phenomenon in which two or more relatively light atomic nuclei combine to form a heavier atomic nucleus, releasing a large amount of energy in the process.

Nuclear fusion requires the creation of plasmas, which are generated by stripping atoms of their electrons at high temperature, to leave a uniform mixture of moving charged particles, including both free electrons and atomic nuclei.

The ILE team first aimed a 10-kilojoule laser beam (one joule is equivalent to 0.7375 foot-pounds of energy) at a temperature of 10 million degrees against plastic shell targets. The targets, consisting of carbon, heavy hydrogen, and tritium, had a radius of 0.5 millimeters and a thickness of 10 microns.

Then, the team added small amounts of silicon in order to measure the neutrons released during the experiment.

Using a newly-developed random phase plate device, the team recently succeeded in compressing the plastic shell targets to a density of 600 grams per cubic centimeter, or 600 times denser than the original state.

ILE had succeeded in compressing the shell targets to 100 times their original density last year.

The ILE researchers contend that if a 100-kilojoule laser beam is applied to plastic shell targets with a radius of around three millimeters, nuclear fusion should, at least in theory, occur.

To create nuclear fusion, the targets must be compressed to a density radius of 0.3 gram per square centimeters, at a temperature of 100 million degrees celsius.

Under such conditions the shell targets would become 500 to 1,000 times denser than the original state.

Sadao Nakai, director of the institute, said of the successful compression experiment, "it is the largest step forward toward our goal so far."

"We have already generated a temperature of 100 million degrees. The next thing to do is to build a laser system that can produce more powerful beams to achieve the temperature and the density simultaneously," he said.

A senior researcher at the institute said, "I think we can achieve nuclear fusion in five to six years."

## NORTH KOREA

### ROK Intelligence Alleges Nuclear Weapons Effort

SK0607044189 Seoul THE KOREA TIMES in English  
6 Jul 89 p 1

[Text] North Korea is believed to have come closer to producing nuclear weapons as latest intelligence reports revealed the construction of a high-explosive testing site near what is known to be a nuclear reprocessing plant.

The reprocessing plant is located in Yongbyon about 100 kilometers north of Pyongyang.

North Korea is expected to possess a capacity to produce nuclear weapons probably by the middle of the 1990s, intelligence officials have said.

They said that the administration was informed of the facts by U.S. experts during a briefing session for working-level officials from the Foreign, Defense, Energy-Resources and Science-Technology Ministries last Friday.

American disclosed that satellite cameras detected four to five other reactors under construction next to a 300,000-kilowatt reactor which has been in operation since October 1987.

One of the reactors is most likely to be in the 500,000-2,000,000 kw class.

The exact use of the high-powered reactor has been unknown but the experts presumed that it may reprocess nuclear waste which could be used for the production of nuclear weapons. The reactors are now being constructed with North Korea's own technology without assistance from the Soviet Union and China.

The North's capacity in the nuclear field had so far been underestimated, probably because of its propaganda for a nuclear-free Korean peninsula.

Judging from the nuclear facilities detected by satellite cameras, the experts were quoted as saying that the North is preparing for the production of nuclear weapons in several years.

The existing 300,000 kw reactor is capable of producing 7-8 kilograms of weapon-grade material over an extended period. That would be sufficient for a one kiloton bomb, according to the intelligence officials.

It uses natural uranium, mined in Pyongsan, some 50 kilometers north of Yonbyon, and graphite, not enriched uranium fuel, in order to lessen the North's dependence on foreign supply and circumvent the Soviet practice of only leasing fuel rods so as to retain control over their use, they said.

After learning of the Yongbyon facilities, Washington has approached Moscow, which pressured Pyongyang into ratifying the Nuclear Non-Proliferation Treaty on Dec 12, 1985.

But the North has yet to conclude a full safeguards agreement with the Vienna-based International Atomic Energy Agency to cover all its nuclear facilities.

Only two Soviet-supplied 20,000-40,000 kw research reactors, also at Yongbyon, came under the agreement. The IAEA has monitored the research reactors producing radioactive isotopes for medical and other similar purposes under a "Type 66" agreement signed with Pyongyang 12 years ago, to which experts give little attention due to their very low yield.

Korean specialists are, however, generally skeptical of the North's overall capability to reprocess spent fuel and make nuclear warheads.

"The North seems to have neither sophisticated science and technology nor sufficient funds," said an expert who asked not to be identified.

North Korea is just beginning to install a nuclear-generated power plant. Moscow formally agreed to supply the country's first nuclear power station last October, one of 14 otherwise conventional industrial plants to be built with Soviet aid over the next five years, they noted.

#### **Progress Toward Nuclear Weapons Capability Suspected**

SK1307075489 Seoul YONHAP in English  
0628 GMT 13 Jul 89

[Text] Washington, July 13 (YONHAP)—North Korea is perilously close to making nuclear weapons, pushing ahead at full speed with construction of a facility for

plutonium extraction while willfully refusing to sign a safeguard agreement under the nuclear nonproliferation treaty, an American expert on Asian affairs testified to Congress Wednesday.

An informed source here, meanwhile, noted that the United States, alarmed at the prospect of North Korea joining the nuclear club, has been asking the Soviet Union and China to put pressure on Pyongyang to sign a safeguard stipulation drawn up by the International Atomic Energy Agency (IAEA) and allow safety inspections of its nuclear reactors and other facilities.

North Korea is building a plutonium extraction plant near Yongbyon, where it has a large-scale laboratory nuclear reactor, as the last phase of completing facilities to manufacture nuclear devices within a few years, Leonard Spector, a researcher at the Carnegie International Peace Foundation, said during a congressional hearing.

The reactor in Yongbyon, North of Pyongyang, was completed in 1986 and can produce enough plutonium to manufacture one or two nuclear weapons annually, said Spector, testifying before a joint meeting of house subcommittees on arms control and international economic policy and trade.

Recent intelligence reports suggest the extraction plant is being built near the reactor, he said.

Spector said it is unclear how work on the plutonium plant is progressing.

If North Korea stubbornly insists on refusing to sign the IAEA safeguard agreement despite its capability to manufacture nuclear devices, it will create strong suspicions that may induce South Korea to develop nuclear devices in self-defense, he said.

Pyongyang signed the Nonproliferation Treaty in 1985 but has yet to sign an obligatory safeguard provision that allows the IAEA to inspect all nuclear facilities.

Spector quoted William Webster, director of the U.S. Central Intelligence Agency, as telling a recent congressional hearing that North Korea is capable of developing a Scud missile that can carry a one-ton nuclear warhead 320 kilometers.

The Bush administration is strongly asking the Soviet Union to press the North to sign the safeguard accord at a general IAEA meeting to be held in September in Vienna, the source said.



## CZECHOSLOVAKIA

### Nuclear Plant Safety System Described

PM1807102989 Moscow PRAVDA (Second Edition) in Russian 10 Jul 89 p 5

[Report by A. Rudenko: "So That the Alarm Bells Need Not Ring"]

[Text] At the "Electrification" pavilion at the USSR Exhibition of National Economic Achievements in Moscow recently there was an exhibition called "Interatomkontrol-89." Specialists' attention was drawn to "SOS," a nuclear power station control system unparalleled in the world. It is presented by the Czechoslovak concern Skoda.

"What is the reason for its success?" I asked Stanislav Cichon, the system's designer.

[Cichon] Nuclear power stations in Czechoslovakia already generate one kilowatt-hour in every four and by the end of the century our nuclear power stations will generate one-half of our electricity. There is no alternative, and therefore the CSSR is investing great material resources and intellectual potential in the sector's development. The question of nuclear power station safety is especially important for a small country like Czechoslovakia. So it is no coincidence that we aimed for the best world standard with the "SOS" control system.

[PRAVDA] Incidentally, where did that thought-provoking name come from?

[Cichon] It is simply an abbreviation of the Czech expression "special protection system." The distinguishing feature of "SOS" is the continuous testing of the sensors, that is, the most vulnerable link of such systems. That removes the need for preventive checks. I would point out that a mechanic carries out a check once a shift, a whole team of specialists conducts a survey once every 2 months, and once every 6 months.... And so on and infinitum. If anything happens to the "SOS" sensor the system itself immediately decides what to do: For example, it will allow 10 minutes for a repair and, if necessary, it will shut the reactor down. At the same time this reduces the scope for those who like to tinker with technology to the detriment of people's safety.

Meanwhile, thanks to the use of continuous automatic testing and artificial intelligence components, it has been possible to reduce the instrument's size (the electronic unit is housed in two small wall cupboards) and to keep costs to an acceptable level (several tens of thousands of rubles).

[PRAVDA] What is the system's future now?

[Cichon] It has been installed at two electric power stations in Czechoslovakia. Industrialists from the FRG and Denmark wanted to buy a production license for "SOS" but at the moment the system has no equivalent and it is more advantageous for us to export ready-made instruments, so we refused. Soon the first instruments will be sent to Finland and China. Talks are being held on a sale to the Soviet Union as well.



## ARGENTINA

### New Atomic Energy Chief Named

PY1007170189 Buenos Aires TELAM in Spanish  
1543 GMT 10 Jul 89

[Text] Buenos Aires, 10 Jul (TELAM)—At noon today President Carlos Menem installed Manuel Mondino as the new chairman of the National Commission for Atomic Energy [CNEA].

The ceremony began at 1222 [1522 GMT] at CNEA headquarters, 8250 Libertador Avenue, Buenos Aires. Also present were Interior Minister Eduardo Bauza, Presidential Secretary General Alberto Kohan, and Press and Broadcasting Secretary Jorge Rachid.

### CNEA Chairman-Designate on Projects, Policy

PY2906153889 Buenos Aires TELAM in Spanish  
2135 GMT 28 Jun 89

[Text] La Rioja, 28 Jun (TELAM)—Manuel Mondino, chairman-designate of the National Commission for Atomic Energy [CNEA], has said that during his administration the construction of the Atucha II nuclear plant and the Arroyito heavy water enterprise will be completed.

Mondino explained that President-elect Carlos Menem has approved obtaining the necessary financing to complete these projects, which are currently under construction.

The new CNEA chairman, who met with Menem at his official residence, stated that the current energy crisis "has resulted from neglecting the nuclear plants and from failing to form development plans, as in the case of Atucha II."

Mondino, who until now was CNEA development manager, said that the energy problem is a "sword of Damocles, because any slightly optimistic assessment of the country's development within the framework of the productive revolution will show that we will be constantly short of energy."

He also referred to the scientists who have left the country in the past few years and asserted that "the vacuum is due not only to an uncontrolled brain drain but also to the fact that little assistance is given to those who remain in the country."

Mondino said that "it is necessary to create suitable conditions for the scientists and technicians in Argentina by giving them support. As soon as the new government gives the word, we are going to stop the flight of our scientists, and those abroad will recover their hope of returning to the country."

When asked about the degree of dismantlement of the CNEA, he asserted that "it cannot be quantified," but he noted that the "serious budget cuts implemented during the past few years have left the CNEA on the bottom of the current government's list of priorities."

Mondino, who is 52, was born in Santa Fe Province and graduated with a degree in physics from the Balseiro Institute in 1959. After that he carried out studies on metals at the Institute of the University of Chicago [name as received]. The knowledge he gained from those studies he then used at the Bariloche nuclear plant.

Mondino lectured at the Swiss Federal Polytechnical School between 1972 and 1974, and again in 1977. He also carried out research in France and has been working for the past 6 years at the CNEA, where he has held the post of development manager.

## BRAZIL

### Scientists' Charges of Intent To Build Bomb Refuted

#### Foreign Ministry Statement

51002055b Rio de Janeiro O GLOBO in Portuguese  
28 Apr 89 p 19

[Text] Brasilia—The Foreign Ministry yesterday reiterated the Brazilian decision not to produce the atomic bomb even if it should have the capability to do so—as was stated in a bulletin by American scientists edited in Washington, which is to be published in a few days. Foreign Ministry spokesman Ruy Nogueira said that this is not only a decision of the government but one that is written into the Constitution.

Nogueira declared that President Jose Sarney has issued unequivocal statements on the peaceful objective of Brazilian research, including statements before Argentine President Raul Alfonsin during the visit they made to Aramar, where the parallel nuclear program is being developed.

According to Ruy Nogueira, there is no danger, as the Americans say, of an arms race between Brazil and Argentina in view of the stage of technological development achieved by them.

The American scientists also expressed their concern about candidate Carlos Menem's possible accession to the Argentine presidency. According to them, he takes a dim view of the rapprochement between Brazil and Argentina, especially in the nuclear field. Brazilian diplomatic sources gave assurance that this fear is unfounded because Menem has already sent messages to the Brazilian Government pledging that, if elected, he will fulfill all commitments and will carry forward the integration process.

#### CNEN Repudiation

51002055b Rio de Janeiro O GLOBO in Portuguese  
22 Apr 89 p 21

[Text] The chairman of the National Nuclear Energy Commission (CNEN), Rex Nazareth Alves, yesterday repudiated the language of the Bulletin of American Scientists and reiterated that Brazil will not build bombs.

"I completely repudiate that interference. It is Dr Albright who should reexamine his initial contribution to nuclear proliferation. We will not build bombs because that is not in the spirit of Brazilian society. Let those who build them not come and give us lessons in ethics. The Brazilian National Congress and our Constitution have determined that the purpose of nuclear energy shall be peaceful. Those who concern themselves about us should concern themselves about proposing similar articles in their constitutions," he declared.

Rex Nazareth pointed out that Albright, one of the members of the Manhattan Project, is one of the fathers of the first American atomic bombs. He made it a point to emphasize that the National Congress is the only organization he recognizes as having the right and the duty to monitor and oversee the activities of the Brazilian nuclear program.

"As long as I am alive, national interests will be safeguarded. The United States is not going to oversee our centrifuges," he declared.

Rex Nazareth said that the Aramar Research Center was designed to produce enriched uranium up to a maximum of 20 percent, although technically—as the article states—it may be able to produce uranium enriched up to 96 percent, that necessary for nuclear devices.

"What that bulletin does not say is that it was becoming infeasible to operate our research reactors, as well as guarantee the fuel supply for our energy-producing reactors," he said.

As for a future nuclear race between Argentina and Brazil, Rex Nazareth said that there is no possibility that that will occur. He declared that the continuity of the joint programs between the two countries is not at risk.

#### **FRG Official Views Brazil's Capability of Making Bomb**

51002057c Rio de Janeiro O GLOBO in Portuguese  
3 Jun 89 p 18

[Text] Bonn—Argentina and Brazil are capable of building an atomic bomb in the near future, according to a statement to the Parliament in Bonn yesterday by the head of the FRG's secret service, Hans Georg Wieck. Speaking before a parliamentary committee investigating alleged illegal exports by West German firms in the field of nuclear energy, Wieck said, however, that he did not know whether Argentina and Brazil intended to make military use of the technological know-how they have now mastered.

Besides the big nuclear powers, nine other countries are either on the way to being able to make nuclear weapons or may soon be in a technological position to do so. But the head of the secret service provided no details on that subject, not wishing to reveal his working methods or expose the sources from which the information was obtained.

At that point, the session was declared closed to the public, and nonmembers had to leave so that Wieck could add other information. According to the public report, it is not out of the question that although they have signed the Nuclear Nonproliferation Treaty, Iran, Iraq, and Libya may decide to manufacture nuclear weapons. But those countries will be able to continue developing the technology in question only if they receive help from abroad. India, which has not signed the treaty, is in a better position to carry out any nuclear project successfully.

It can be considered that Israel and Pakistan also have the same capability, although on a more limited scale, while South Africa has already had the potential for building the bomb for several years, said Wieck.

#### **Country 'Categorically Denies' Building Atomic Bomb**

PY1007204489 Madrid EFE Spanish  
1313 GMT 8 Jul 89

[Text] The Brazilian Foreign Ministry, Defense Secretariat, and Navy have categorically denied that the country is building an atomic bomb as was asserted on 6 July by a U.S. document.

Foreign Ministry spokesman Ruy Nogueira has said that the Hemispheric Affairs Council report "is totally baseless," because the use of nuclear energy for war purposes is forbidden by the Constitution.

Regarding the program of space cooperation with the PRC—also under suspicion—Ruy Nogueira said the program is specifically designed for the launching of two satellites essential for the definition of the country's territory.

Meanwhile, the National Defense Advisory Secretariat (SADEN) has said the document, which was released by a U.S. private institution specializing in Latin American affairs, is "fantastic."

The secretariat also said that the document is part of an organized conspiracy to prevent Brazil from reaching technological independence in nuclear matters.

A high-ranking Navy source said that Brazil has already mastered the technology necessary to build an atomic bomb but the project has never been contemplated by Brazilian defense policies because the Constitution specifically forbids it.

#### **Nuclear Policy Draft Bills To Go to Congress**

##### **Bills Described**

51002057a Sao Paulo FOLHA DE SAO PAULO in Portuguese 15 Jun 89 p A-5

[Text] Brasilia—Two draft bills setting national nuclear policy and establishing a process for selecting sites for the storage of nuclear waste will probably be submitted to Congress by Planalto Palace tomorrow. During a

meeting of the Higher Council on Nuclear Policy yesterday, President Sarney approved the bill drawn up by experts at the Catholic Pontifical University (PUC) in Rio de Janeiro. It provides for the construction, using Brazilian technology, of containers that will hold the waste resulting from the accident with cesium-137 in Goiania (Goias). The final storage facility will be located in the State of Goias itself and will cost the Federal Government 14 million new cruzados. The actual site has not yet been chosen.

The first point in Brazil's nuclear policy was taken from the constitution: "All nuclear activity in the national territory will be used for peaceful purposes and with the approval of the National Congress." The bills are intended to establish guidelines for the development and use of nuclear energy by the states, confirm Brazil's position in that area (the right to sovereignty and respect for international commitments) and establish objectives in connection with mastery of the nuclear fuel cycle—including scientific and technological training and the development of reactors. The bills were drawn up under the coordination of the minister-chief of the Military Household of the Presidency, Rubem Bayma Denys.

The bill dealing with radioactive waste transfers responsibility for building storage facilities to the states. "The process of selecting sites will include the participation of various sectors of society and the municipal governments. In addition, the state may collect a fee from users of such sites (hospitals, for example)," said the chairman of the Advisory Committee on Radioactive Waste, Joaquim Carvalho.

Speaking over a hookup of all radio and television stations in Sergipe yesterday, President Sarney discussed the visit he will make to the Xingo hydroelectric plant today to inaugurate the Delmiro Gouveia Bridge. The president will also visit the port of Aracaju, which is now under construction. He said that the port would meet a "century-old aspiration on the part of Sergipe's people."

#### Further Data Provided

51002057a Rio de Janeiro O GLOBO in Portuguese  
15 Jun 89 p 8

[Text] Brasilia—The Higher Council on Nuclear Policy submitted the draft bill on national nuclear energy policy to President Sarney yesterday. That bill, which will be sent to the legislative branch by Tuesday, provides that all nuclear activity in the national territory will be permitted only for peaceful purposes and with the approval of Congress.

Those present at the ceremony for handing over the bill included Rex Nazareth, the council's chairman, and General Bayma Denys, minister-chief of the Military Household of the Presidency and secretary general of the National Defense Advisory Secretariat (SADEN). Bayma Denys observed that the bill, which is in compliance with constitutional principles, rules out the building of an atomic bomb by Brazil. But if the bill on

national nuclear energy policy is approved by Congress, it will ensure the country of complete mastery of the fuel cycle and the sovereign right to determine its use, with international commitments being respected.

According to one of the council members, nuclear physicist Jair Carlos Melo, the ban on building the bomb does not compromise the country's security. Melo, who heads the Department of Nuclear Energy at the Federal University of Minas Gerais, believes just the opposite: that without the bomb, Brazil will be in a more comfortable position because it will not be a target for other powers:

"Why does Brazil need the atomic bomb? The problem as far as national security is concerned is the internal, social, and regional imbalances. Even in an international conflict, what good would it do for us to have one bomb against the countless weapons in the arsenals of the nuclear powers?"

The nuclear physicist added that public opinion's persistence in linking atomic energy to its military uses has harmed the policy for Brazilian nuclear development. He emphasized that that association in the mind of the public has been creating "waves of impasses" making it difficult to establish projects "that benefit the country itself."

The bill on national nuclear energy policy is divided into five parts: basis, aims, presuppositions, objectives, and guidelines. It regulates the structure that was established for the sector by a presidential decree in August of last year.

#### Congress To Decide on Nuclear Waste

Brasilia—Next week, President Sarney will send Congress the bill on radioactive waste, which makes the states using nuclear energy responsible for building and maintaining waste storage facilities. The bill also provides that the community at the municipal level will participate in selecting the areas where intermediate and final storage facilities will be constructed. Those facilities will be built according to designs produced by the National Nuclear Energy Commission (CNEN) and under the latter's technical direction and supervision.

In the opinion of CNEN chairman Rex Nazareth, the government bill is in keeping with the principle of federalism and will encourage development of the states, since advanced technology will be transferred to them. The bill provides that the state governments may collect fees for maintaining storage facilities.

"Radioactive waste involves fears, but they are unfounded because this is a service like refuse collection, sewers, or anything else," Nazareth argued.

At the meeting of the Higher Council on Nuclear Energy, the president also announced that he would ask Congress for a supplemental credit of 14 million new cruzados for building containers and setting up a storage facility for the atomic waste produced by the accident with cesium-137

that occurred in Goiania in September 1987. The president decided to reject the plan to have a consortium of Brazilian and Italian firms build a storage facility for radioactive waste. According to the CNEN, that project—which was being negotiated by Governor Henrique Santillo of Goias—would cost three times as much and would be dependent upon international technology.

If Congress approves the request for a supplemental credit this month, the storage facility for the waste from Goiania can be completed by December. The CNEN has already identified eight areas in Goias as suitable sites for that waste, which is being stored in 4,258 metal drums, 1,320 1.7-cubic-meter cases, 10 containers, and 8 concrete pipes in Abadia, 150 km from Goiania.

### Country's Nuclear Program Undergoes Change

#### Fast Breeder Program Proposed

PY1207035689 Sao Paulo FOLHA DE SAO PAULO in Portuguese 10 Jul 89 p 8-A

[By Tania Malheiros]

[Text] Rex Nazareth, 52, president of the National Commission for Nuclear Energy (CNEN), has said that Brazil and Argentina are jointly developing the technology to build the first reactor capable of regenerating fast neutrons ("fast breeder") in Latin America.

The main advantage of this reactor is its ability to produce its own fuel. It is called a fast breeder reactor. It consumes uranium and plutonium, and produces plutonium. According to Nazareth, the Nuclear Engineering Institute (IEN) of the CNEN headquartered in Ilha do Fundao (northern zone of Rio), is testing "fast breeder" components and systems. Argentina is responsible for supplying the fuel.

Rex Nazareth said the project was born 2 years ago after the two countries realized that "each was doing things that could be put together to make the program feasible." Nazareth explained that experts from the two countries met to define the details and the resources needed for the project. According to Rex Nazareth, the "fast breeder" reactor will be capable of attending to the needs of the entire world.

Nazareth said that Brazil and Argentina had to slow the development of the "fast breeder" program because of the economic problems the two countries face. Despite the difficulties, however, the two countries are trying to implement other complementary programs to maintain and develop what is considered a priority program. The program to develop the fast breeder reactor could take up to 25 years. Nazareth said that other Latin American countries could participate in similar programs if their technological development permits.

According to Nazareth, the international market price of \$40 (140 cruzados at the parallel exchange rate) per kilo of uranium makes the development of the reactor too

expensive for some countries. Nazareth said that the fact that Brazil has the fifth largest uranium reserves in the world places the country in a very favorable situation for the development of the program with Argentina.

According to Nazareth, Brazil and Argentina are currently cooperating in the nuclear area in matters of security, materiel, nuclear fuels, and instrument development. The two countries participate "as a block" in the "International Working Group of Fast Reactors," which include the "fast breeder." The working group is a branch of the International Atomic Energy Agency (IAEA) headquartered in Vienna, Austria. "We participate as observers," Nazareth said.

#### Nuclear Program Threatened

PY1207190089 Rio de Janeiro O GLOBO in Portuguese 11 Jul 89 p 14

[Text] Sao Paulo—A shortage of funds is threatening the implementation of the Brazilian nuclear program and can interfere with three of the program's main projects: the production of nuclear fuel for research reactors, the development of a model reactor to be used in submarines, and the production of radio isotopes for medicinal use.

Rear Admiral Othon Pinheiro da Silva, coordinator of the Navy's Special Projects, and Claudio Rodrigues, superintendent of the Institute for Nuclear and Energy Research, IPEN, admit that the program will be delayed. The situation is thus very serious, because the nuclear fuel stock will last 1 year, at most.

Because Brazil has been a victim of an international boycott and has not been able to import nuclear fuel since 1978 because it has not signed the Nuclear Non-proliferation Treaty, the only solution for the country is to produce its own fuel. Brazil needs the fuel for the research reactors and will use it for a submarine reactor in the future.

Two stages of nuclear fuel production—the initial one, in which the uranium paste is transformed into gas; and the last one, in which the fuel is actually produced—are undertaken at IPEN. The other stages are conducted at the Aramar Center. Any delay in the program's schedule will prevent Aramar from meeting its goal of producing 12 kg of uranium enriched to 20 percent by January.

Othon Pinheiro da Silva said the construction of the Reactors Development Center—which will house the first prototype of the submarine reactor—will also be affected if the 50-million-new-cruzado fund approved for this year is not up-dated and readjusted. The shortage of funds at IPEN affects not only fuel production but also radioisotope production. IPEN's superintendent, Claudio Rodrigues, said he will have to postpone the projects to speed up the operation rhythm of the research reactor and to increase its capacity to 5 megawatts. These projects, the implementation of which was scheduled for September, are fundamental to making Brazil self-sufficient in the production of radioisotopes.



**Progress of Submarine Construction Reviewed**  
33420066z Rio de Janeiro MANCHETE in Portuguese  
27 May 89 pp 25-30

[Article by Helio Contreiras]

[Text] There is a lot of activity at the Rio de Janeiro Navy Yard. Workers and engineers are joining two sections of the external shell of the first conventional submarine manufactured in Brazil, a starting point for a future atomic submarine. Navy Minister Admiral Henrique Saboia points out that only technologically advanced countries like the United States, the Soviet Union, China, France, England, and West Germany build these kinds of superweapons. Brazil is entering an ultraexclusive club, and is taking a deep breath before plunging into the waves of modern naval war strategy.

A few months ago, MANCHETE was given exclusive rights to document the start of construction on Brazil's first submarine, which it will be launching in the waves of modern naval war strategy. Today the dream of all generations of sailors—already well under way—is beginning to become a reality. In giving priority to construction of this warship, Navy Minister Adm Henrique Saboia pointed out that submarines are built only by countries that are highly advanced technologically, like the United States, the Soviet Union, China, France, England, and the Federal Republic of Germany. He also said that advances in naval technology are beneficial to countless areas of exclusively civilian interest.

At the Rio de Janeiro Navy Yard, in a huge machine shop with 70 skilled workers earning above-average wages, the frame of the first Brazilian submarine is beginning to take shape, based on a West German design. The day on which MANCHETE's photographer appeared at the shipyard, the workers and engineers were involved in a special job. They were preparing to join two sections of the warship's hull. This is the start of shaping the frame. The Navy gave Nuclep [Nuclebras Heavy Equipment], a subsidiary of the former Nuclebras, the job of manufacturing the hull, which helped that state enterprise to breathe more easily by reducing its high rate of idle workers. This problem was caused by a slowdown in the pace of the Brazilian Nuclear Program, under which earlier ambitious plans called for construction of nine nuclear plants. Nuclep, as an obvious result of the program cuts, was fully prepared to handle the Navy's order.

One of the most complicated jobs being done by the Navy Yard workers is soldering the sections of the hull. A second stage in construction will require moving the ship to a floating dock which is in the final stage of construction at the Rio Navy Yard itself. Adm Henrique Saboia regards construction of the submarine as a very important link in the Naval Reequipment Plan, a program that has experienced setbacks as a result of budget restrictions.

The cost of the submarine project is \$120 million, and construction is guaranteed by an external loan, which is

disbursed as needed. The Reequipment Plan provides for the construction of three IKL 209 1400-type submarines, similar to one ordered from the Federal Republic of Germany and scheduled to arrive next June in Brazil, called Tupy. All are as technically advanced as the American type.

To build the submarines, the Rio de Janeiro Navy Yard had to be reorganized so that it could handle the Navy's order. It had previously been equipped to build another type of sophisticated ship, a corvette. But it is only responsible for construction of two of the four corvettes scheduled to be built in the present stage of the Reequipment Plan. One reason for this is that the Navy decided to give projects of interest to civilian shipyards to them, so that the unemployment problem in the shipbuilding industry would not get worse, as orders for merchant ships have fallen off since the start of this decade. This problem has already led shipyards to lay off over 15,000 workers, forcing some yards into creditors' hands.

Next year the submarine under construction will be taken to the dock. It is scheduled to be launched in 1991, and will become part of the Navy that same year. But by 1990 two more submarines will be under construction at the Navy Yard, since by the second half of this year Nuclep will have begun manufacturing the hull of the second one. There will therefore be a lot of work in the coming years for the 10 engineers and technicians involved in building the submarines: welding frame sections, constructing piping, machining, electricity, etc. In the general context of the Submarine Department, there is another item that the Navy considers relevant: acquisition of technology. The real chess game involved in joining the various pieces will considerably improve the technological training of the engineers and the professional skills of the technicians. They really constitute a strategic labor force, which is difficult to train and which the Navy Yard hopes to keep to eliminate technological dependence in the construction of sophisticated warships.

What do submarines represent for nations? The Navy's chief of staff and former director of Navy Materiel, Admiral Mario Cesar Flores, answers: "It is an essential warship for modern navies, which permits a higher degree of mobility on the seas than that provided by surface vessels. As for dependence on foreign countries for construction of warships, this of course entails limitations. Even maintenance depends on the expediency of the suppliers. If there are international complications, maintenance inevitably encounters problems."

With the prudence common to strategists (this is how he is regarded in military circles), Flores avoids drawing comparisons. But one thing is certain: If Argentina had had at least six submarines at the time of the conflict involving the Falkland Islands in 1982, the British reaction would have been much more difficult. The British would have encountered problems.

One question is always asked when Brazil has an expensive military project: How can a country with so many

social problems spend so much money on its Armed Forces? The Navy chief of staff realizes that this question is directly related to another situation and to an old saying: "In Brazil, the lock is not repaired until the door has been broken down; or, people do not take care of themselves until they get sick." Like his colleague, Fleet Commander Admiral Ivan Serpa, the naval chief of staff recalls one truth: "It is no longer possible to do what was done during the Second World War, that is to improvise naval projects and decide 2 months beforehand to build warships and train the men to operate them."

If the technological paraphernalia involved in a warship is truly gigantic, officer training is not as simple as it was in the time of sailing ships or U.S. destroyers during World War II. At that time the United States successfully improvised construction of various warships after the attack on Pearl Harbor by the Japanese.

The construction of conventional diesel-powered submarines is a stage the Navy must go through. It is impossible to wave a magic wand and begin by building nuclear submarines. That would be like going from a turboprop airplane to a supersonic, without first developing a jet plane, or from a steam locomotive to a bullet train. Thus, next June the Navy is planning to obtain an IKL 209 I 400-type submarine, built in West Germany, and to build at its Rio Navy Yard three similar submarines based on German designs. Then the N-1 submarine will be built on the basis of the Navy Engineering Office's design. This model will have some features of the nuclear submarine, such as submersion, command, and weapons systems. The N-1 may be ready by 1994 or 1995. A nuclear submarine is not planned to be included in the fleet before the end of the century.

Fleet Commander Admiral Ivan Serpa also said the following: "The submarine has a three-dimensional movement, it needs to be solid. Its hull must resist extreme external pressures. It represents an important technological advance." Adm Serpa pointed out that the country currently has three Oberon-type submarines built in England in the past decade: Humaita, Riachuelo, and Tonelero. It also has three U.S. Guppy-type submarines: Bahia, Amazonas, and Goias. The fleet commander reported that the Americans are restricting the manufacture of spare parts. Their equipment has become obsolete faster. The same problem is not of course true of the Oberon submarines, which are more modern and technologically up-to-date.

Ivan Serpa also argues that the fact that Brazil has no enemies does not mean it can afford to do without armed forces. Although the range of missiles was 60 meters at the time of World War II, today these weapons have equipment that allows them to correct their trajectory to reach long-distance targets. They have target-search radar.

Thus when they are programmed for a specific target, the moment of impact can be predicted by computers. Developments in military technology have enhanced the importance of training a ship's crew. "The days when

recruits were paid and placed on a ship are over. The men have to be properly trained. The time of improvisation is over."

Nobody at the Navy doubts that the construction of the first conventional submarine will lead to construction of a nuclear submarine by the end of the next decade. Nor does anyone dispute the fact that the next submarines, even conventional ones, to be built at the country's Navy Yard will considerably raise the Navy's firepower. Equipped with highly sophisticated sensors, and a well-equipped fire direction system, not just for tracking but also for attacking multiple targets, the IKL 209 I 400 submarines represent the most modern technology in conventional submarines, according to the commander of the Submarine Force, Admiral Sergio Tasso de Aquino.

For Adm Tasso, it is absolutely essential to the country's external security for this warship to be built in Brazil. "Modern submarines with long ranges and considerable destructive power are capable of operating at great distances from their bases and even in areas frequented by the enemy, without being detected." Sergio Tasso de Aquino defends the nationalization of the systems, subsystems, and the warship itself, whatever vessel is involved. "The operational sophistication of modern submarines, the fruit of the high technology of their use, is obviously reflected in high costs." The whole support philosophy and the resulting systems integrated in them incorporate what is best about the latest generation of submarines.

What is the importance of submarines in modern military strategy? This can actually take various forms, but for Navy Chief of Staff Admiral Mario Cesar Flores, the primary characteristic of the submarine is its ability to operate clandestinely. "In certain circumstances, the role of the submarine in controlling an area can increase, without dispensing with ships and aircraft, mainly if the adversary is using aircraft, against which the submarine is useful only for detection and warning."

In the Falkland Islands conflict in 1982, the British submarines prevented the Argentine surface ships from entering the scene of the conflict after the cruiser *Belgrano* was sunk, but the resulting naval supremacy would not have been enough. What allowed them to retake the island was the capabilities of the British Air Force and fleet of surface ships to operate in the area, despite the efforts of the Argentine Air Force. In analyzing the 1982 conflict, Adm Flores makes it clear that the British success in the Falklands, attributed in the final analysis to its ships, aircraft, and land forces, would have been much more difficult to achieve without the participation of the submarines to control the theater of operations.

According to the Navy chief of staff, Brazil needs to have adequate military power to ensure its security. "Brazil should be able to impede hostile aircraft or ships from moving in and prevent its coastal waters from being used by a possible enemy (you will recall the French-Brazilian conflict in 1963 over lobster fishing in the waters of northeastern Brazil.)" This, in the view of the Navy's



chief of staff, entails an ability to control the waters along the coast by ships (with their helicopters), aircraft flying over the land, and, in a supporting role, submarines, which could be conventional ones. Nuclear submarines would be more appropriate if submarine operations need to be conducted in distant areas, along the vectorial axis of the threat. On the basis of these factors, the admiral argues that Brazil should have both the conventional and the nuclear submarine.

He goes on to say: "Since the defense (close in and at a distance) of the ocean border deserves priority attention, there could be more conventional than nuclear submarines. In the long run, with the growth of Brazil's international projects, responsibilities, and interests, it will need to increase its presence in the distant waters of the South Atlantic, and this will lead to a need for more nuclear-powered submarines. One of the obvious reasons for this is the fact that nuclear submarines have a much greater range than conventional submarines, which are much more limited in their operability by refueling requirements.

The Navy's chief of staff also maintains that the ever important defense of the seacoast will not be jeopardized by this development. On the contrary, the nuclear submarine can do as well or even better what the conventional submarine does, and it can be used for distant defense, which puts it in a good position to discourage threats to Brazil by sea.

Mario Cesar Flores pointed out that in order to master nuclear submarine technology, one must first master the technology of the conventional submarine. "The current conventional submarine program is going to give us the know-how so that we can make the big leap to the nuclear submarine, perhaps towards the end of this century."

According to Mario Cesar Flores, the Navy is also doing research on submarine weapons systems, with a view to manufacturing some equipment for which the technology would be difficult to acquire. The weapons system on conventional submarines built at the Naval Yard will be similar to the system for nuclear submarines.

The naval chief of staff went on to say that Brazil is not receiving foreign support for its program to develop nuclear submarine technology. "On the contrary, we are meeting with resistance, pressures, and obstacles from other countries in all the following areas: technology pertaining to fuel, processing the ore to obtain enriched uranium ready for the reactor; reactor technology; the technology of the mechanical equipment (heat generator, heat exchangers, turbines, pumps, electric motors, and others, all duly integrated); and the technology for control of a potential naval nuclear system."

The Navy is participating in the Autonomous Nuclear Program with the National Nuclear Energy Commission, through which the country acquired the technology for enriching uranium by the ultracentrifuge method. In 5 years, a prototype reactor for submarines will be in operation in Ipero, 20 km from Sorocaba. Adm Flores had this

to say in conclusion: "Taking an unbiased look at what is being done, nuclear propulsion will, in the final analysis, be a product of the autonomous nuclear program and its industrial and technical adjuncts and will have many other positive aspects, not confined to military interests but benefitting numerous civilian sectors such as energy and health." Most goods involved in Brazilian foreign trade (over 95 percent) are shipped by sea.

#### **Budget Cuts Curtail Navy Nuclear Program**

PY1407233189 Rio de Janeiro O GLOBO in Portuguese  
12 Jul 89 p 16

[Text] Brasilia—Navy Minister Admiral Enrique Saboya confirmed yesterday the information published by O GLOBO that the Brazilian nuclear program will be delayed because of budget cuts. Saboya said that the project to build a Brazilian nuclear submarine, which is considered a priority by the Navy, will have to be administered by the ministry, whose budget suffered drastic cuts early this year.

He added that the nuclear program will be delayed in accordance with the large budget cuts. The program could get a new impulse if additional funds are obtained between now and the end of this year. He also added that the contracts for supplies and services already signed will be fully fulfilled.

It is not only in the nuclear field where the Navy is facing problems, however. According to experts the Brazilian naval fleet is getting old. The "Tupy" submarine, a German project which was recently commissioned to the fleet, is new. The "Minas Gerais" aircraft carrier, however, has technological equipment of the decades of the forties and the nine destroyers bought from the United States were built between 1940 and 1950.

Admiral Mario Cesar Flores, the Navy chief of staff, told the National Defense Committee of the Chamber of Deputies that the power of the Navy does not represent the potential of the country. Adm Flores who is the second in command in the Navy Ministry told the committee that the Navy Command is concerned because the fleet is getting old.

He said: A large part of our naval power is obsolete and I would not exaggerate if I say that naval training is less than adequate. The absence of external threats does not justify the delay in getting new equipment because naval power cannot be improvised at the last minute.

According to naval sources the construction of a new research ship which will join the "Barao de Teffe" in Antarctic exploration will also suffer budget cuts. The O Estaleiro Caneco company, which won the bid to build the ship, has not started working because the Navy is waiting a loan of \$70 million (120 million new cruzados at the official exchange rate) from the BNDES [National Economic and Social Development Bank]

### **Enriched Uranium To Be Purchased From URENCO**

51002055a Sao Paulo FOLHA DE SAO PAULO in Portuguese 24 Apr 89 p A-7

[Text] Rio de Janeiro—A week ago, the Brazilian Government signed a contract with URENCO (a consortium of Dutch, British, and German companies) for the purchase of enriched uranium for the Angra 1 plant (in operation) and the Angra 2 plant (scheduled to go into operation in 1995), in the municipality of Angra dos Reis (154 km from Rio de Janeiro). That information obtained by FOLHA was confirmed by the president of Nuclear Industries of Brazil (INB), John Albuquerque Forman. He said the deal was excellent because Brazil will pay for only the amount of uranium needed for each plant. The previous contract established amounts to be delivered during a period of a year.

According to John Forman, Brazil will pay the current world price at the time of delivery for the uranium for each nuclear unit. Forman revealed that the first contract signed with URENCO in 1978-79 was for the purchase of enriched uranium to recharge the Angra 1 plant with fuel for the second time—the plant was inaugurated in 1981 and began operation in 1985.

#### **American Veto**

The first charge was purchased from South Africa after the United States vetoed the sale of that product for the unit designed and built by the Westinghouse Corporation, a U.S. company.

According to John Forman, a recharge for Angra 1 requires an average of 66 tons of SWU (Separation Work Units); that is, uranium enriched to 1.2, 2.8, and 3.2 percent.

The SWU cost currently ranges from \$90 to \$250 in the world market, he said. Angra 1 has the capacity to produce 656 megawatts, which is equivalent to 20 percent of the electric energy consumed by the city of Rio de Janeiro. On the other hand, Angra 2 will produce about 1,300 megawatts when it goes into operation, according to Furnas Electric Power Stations, administrator of the nuclear power plants.

#### **Recharge**

The nuclear plants require a new recharge each year of operation. Angra 1 will have to halt operation next August or September to receive the second recharge of fuel, stored in INB facilities in the municipality of Resende (160 kms from Rio de Janeiro). According to John Forman, the contract signed with URENCO "is much more flexible" because it depends on "the plant's

operating schedule." In order not to require a recharge before that period, Angra 1 would have to operate at 50 percent of its reactor's power (the maximum is 100 percent). But due to problems in one of the transmission lines of the Itaipu hydroelectric plant in Parana, the plant has been operating at 85 percent power capacity for the past 2 weeks.

#### **Enriched Uranium**

In the opinion of the chairman of the National Nuclear Energy Commission (CNEN), Rex Nazareth, establishment of the unit for the production of enriched uranium on an industrial scale will be justified by the end of the next decade, when Angra 3 will also be in operation in addition to Angra 1 and 2.

### **Uranium for Angra 1 Reload Stored in FRG**

51002657b Sao Paulo FOLHA DE SAO PAULO in Portuguese 14 Jun 89 p C-9

[Text] Rio de Janeiro—About 16 metric tons of uranium for the fourth reload of the Angra 1 plant in the municipality of Angra dos Reis (154 km from Rio de Janeiro) are being stored at the Siemens plant in the city of Hanau in the FRG. That information comes from Juergen Paleit, commercial and financial manager of URENCO (a consortium of West German, Dutch, and British firms), which is in charge of enriching the product—the fuel that will keep Angra 1 operating for a year beginning in 1991. The third reload is being stored in the municipality of Resende in Rio de Janeiro and is to be delivered to the plant next September, when the unit is scheduled to be shut down.

Enrichment of uranium for the fourth reload is part of a new agreement signed by URENCO and Nuclear Industries of Brazil (INB). The original deal, signed in 1976, provided for the annual delivery of enriched uranium over a 10-year period based on the expected demand at Angra 2 and Angra 3—which were part of the nuclear agreement signed by Brazil and the FRG on 27 June 1975. Since those two plants are not operating, the enriched uranium that was produced was sent to Angra 1, which is the only plant in operation and which was bought from the United States.

According to the current contract, the product will be enriched by URENCO as required for consumption, says John Forman, chairman of the INB. According to Forman and the URENCO representative, Brazil will not pay any kind of penalty for revising the original contract. If Angra 1 is shut down for good and the other two units do not go into operation, the deal will be rescinded, said Paleit. He said the deal was "confidential" and did not reveal its price.

## BANGLADESH

### Atomic Energy Commission Under Education Ministry

51500158 Dhaka THE NEW NATION in English  
20 Jun 89 p 1

[Text] A regular weekly meeting of the Council of Ministers was held on Sunday at Bangabhaban with President Ershad in the chair, reports BSS.

The meeting decided to vest the Bangladesh Council of Scientific and Industrial Research (BCSIR) and the Bangladesh Atomic Energy Commission (BAEC) under the administrative control of the Science and Technology Division of the Ministry of Education. At present these two organisations are in the ministries of industries, and energy and mineral resources respectively.

The atomic power plant to be established at Rooppur will remain under the control of the Ministry of energy and Mineral Resources. The meeting reviewed the progress of the implementation of development projects under the Ministry of Land and Agriculture Division.

The meeting directed the concerned ministries to submit detailed reports on several projects.

## INDIA

### USSR To Help India Build Nuclear Reactors

OW1107030689 Beijing XINHUA in English  
1200 GMT 8 Jul 89

[Text] India plans to build two large nuclear reactors with a 1,000 mw capacity in the 1990s with Soviet collaboration to supplement India's program for establishing 10,000 mw of nuclear power by the turn of the century.

This was announced by chairman of the Atomic Energy Commission M.R. Srinivasan in a lecture in Hyderabad on Friday.

Speaking on "Nuclear Power—Technological and Managerial Challenges," Srinivasan said the objective of self-reliance in nuclear power is being fully achieved in the sense that by 2000, 26 of the 32 reactors then in operation will be based on indigenous design and technology.

The present uranium resources are estimated to support the generation of 10,000 to 15,000 mw, he said, adding that more resources could be found.

According to the annual report of the Department of Atomic Energy for 1988-89, there are three power plants in operation in India which have a total capacity of 1,230 mw.

India's nuclear power generation increased to 6,068 million units in 1988, registering an increase of 14 percent over the previous year.

### Defense Minister Discusses Space, Missile Programs

BK1707141089 Hong Kong AFP in English  
1334 GMT 17 Jul 89

[Text] New Delhi, July 17 (AFP)—India will keep its options open on the development and production of military satellites, Defence Minister Krishna Chandra Pant said here Monday.

Mr Pant told a defence magazine that India would develop the satellites at an appropriate time both for surveillance and as an airborne early warning system. The statement was India's first disclosure that it has military ambitions in space.

"The needful will be done in this regard at the appropriate time," the CHANAYKA AEROSPACE, DEFENCE AND MARITIME REVIEW magazine quoted Mr Pant as saying. But Mr Pant was not quoted as predicting a specific date for possible startup of the project.

The successful May 22 launch of a domestically built medium-range ballistic missile, called Agni (Fire), was a "shot in the arm" for Indian scientists as they had gained confidence in tasks involving complex and sophisticated technologies, Mr Pant said in the interview.

The government had recognised its weakness in not being able to "translate a scientific breakthrough into actual production," the minister said, adding that it has introduced measures to overcome the problem.

Military scientists launched an ambitious guided missile development programme in 1983 and capped it by assembling a surface-to-surface missile called Prithvi, or Earth, in March 1987, followed by the Agni and a series of surface-to-air and anti-tank missile systems.

### 30,000 Being Moved From Missile Test Range

BK0807162289 Delhi Domestic Service in English  
1530 GMT 8 Jul 89

[Text] In Orissa, several special schemes are underway to rehabilitate the people required to be shifted for setting up the national [missile] test range at Baliapal. Disclosing this to newsmen in New Delhi today, the chief minister, Mr J.B. Patnaik, said besides monetary compensation, one member of each displaced family will be given a job. Housing sites and ready-made houses will also be provided. He said a fishing harbor is being constructed near Baliapal to accommodate the local population, and other developmental projects have also been taken up.

Mr Patnaik said the number of persons required to be shifted has been reduced to 30,000 from 72,000. He expressed confidence that the people of the area will be successfully persuaded to accept the project as it was done in the case of the Agni missile firing at Chandipur. In fact, the people have started realizing the necessity of building a test range. The chief minister announced that the state will have a new industrial policy soon to

consolidate the vast industrial gains attained during the last decade. Mr Patnaik said the total central allocation under the Jawahar rozgar yojna [employment scheme] has already been distributed among the panchayats [village councils] and they have drawn up employment plans through gram sabhas [village committees].

## IRAQ

### Foreign Minister Discusses Nuclear Plans

JN1007134989 Paris Radio Monte Carlo in Arabic  
1200 GMT 10 Jul 89

[Excerpt] Iraqi Foreign Minister Tariq 'Aziz has affirmed that France has to date not agreed to rebuild the Iraqi nuclear reactor, Tammuz, which was destroyed by the Israeli Air Force in the summer of 1981. In an interview with KULL AL-ARAB magazine published in Paris, Tariq 'Aziz said that his country needs a nuclear reactor for peaceful purposes. He pointed out that Baghdad had signed a treaty banning the spread of nuclear weapons. It places its institutions continuously under the supervision of the International Atomic Energy Agency. The Iraqi official added: We have the right, like all other nations and states of the world, to search for those who can help in developing our information in the nuclear field.

A French Foreign Ministry spokesman announced last May that there are no talks between France and Iraq to rebuild the reactor. However, he pointed out that the Iraqis had raised the issue recently. [passage omitted]

## PAKISTAN

### Bhutto Pledges To Shun Nuclear Arms Race

LD0907105689 London PRESS ASSOCIATION in English 1014 GMT 9 Jul 89

[By Chris Moncrieff, PRESS ASSOCIATION chief political correspondent]

[Excerpt] Pakistan's Prime Minister Benazir Bhutto pledged today to keep her country out of a nuclear arms race. She said Pakistan wanted to work alongside India in trying to keep the area free from the threat of nuclear proliferation.

Speaking on TV-AM, she went on: "If one of the countries in the region detonates a device it will put tremendous pressures on other countries to follow suit." "While it is true that countries can for the time being take a policy decision not to be party to proliferation and that is why we would like to see a permanent solution to this. [sentence as received] We would like to make our region free from the threat of nuclear proliferation and that is why we would like to work with India as our neighbour to prevent any pressures in the future." Miss Bhutto pledged: "Pakistan has not nor do we have any intention of putting together or making a bomb or taking it to the point where you can put it together." [passage omitted]

### Government 'Helpless' Against Indian Missile Attack

BK0207122889 Hong Kong AFP in English  
1215 GMT 2 Jul 89

[Text] Karachi, Pakistan, July 2 (AFP)—Pakistan would be helpless against a Indian missile attack, Minister of State for Defence Ghulam Sarwar Cheema has warned, while criticizing New Delhi's "hegemonistic designs."

"We do not have the necessary antidote to combat a missile attack," the minister admitted when asked about Pakistan's preparedness against neighboring India's recently tested "Agni" intermediate-range ballistic missile.

Mr Cheema told businessmen at the Karachi Chamber of Commerce and Industry Saturday that special radar and anti-missile systems required for effective defence against a missile attack were "prohibitively expensive."

He added that the Pakistani Government was cognizant of the matter and was doing everything possible "within our economic constraints" to evolve an effective defence system.

The minister said that the successful testing by India last month of the "Agni" revealed New Delhi's "hegemonistic designs" in the region.

India wanted to "control an area stretching from Australia and New Zealand up to Suez in west Asia," Mr Cheema said. Pakistan has fought three wars with India since 1947.

He said that the government was for the first time considering private sector participation in defence production.

The minister called upon the Pakistani business community to come forward with proposals for starting joint ventures with the Defence Ministry for manufacturing defence equipment.

Mr Cheema assured businessmen of a guaranteed market for their products, adding that the government would also help them in acquiring technology transfer and export of defence production.

Yunus Bandukda, president of the Karachi chamber, welcomed the government offer and said the private sector would keenly look forward to such prospects.

Mr Cheema told the National Assembly Thursday that Pakistan would try to acquire a missile similar to India's. Islamabad has already test fired two missiles, one with a range of 300 kilometers (180 miles).

But he also warned that the "Agni"—with a maximum expected range of 2,500 kilometers (1,500 miles) and a payload capacity of 1,000 kilograms (2,200 pounds)—could carry both conventional and nuclear warheads.



**Bhutto, Gandhi Discuss Nuclear Issue**

*BK1707111289 Islamabad Domestic Service in Urdu  
1000 GMT 17 Jul 89*

[Excerpts] Prime Minister Ms Benazir Bhutto has said that both India and Pakistan are determined to continue their efforts for the establishment of peace, gradual reduction of tension, and solving the problems between them. She said this while addressing a joint news conference with the Indian prime minister in Islamabad this morning at the end of his brief visit to Pakistan. [passage omitted]

Ms Benazir Bhutto has removed the Indian prime minister's apprehensions about Pakistan's nuclear program and reiterated that Pakistan is against nuclear proliferation. She said: We are desirous of a solution to this problem, which would herald a better future for humanity. The prime minister rejected Mr Rajiv Gandhi's allegation that Pakistan's nuclear program is under military control. Rajiv Gandhi reiterated that India is against a regional solution of nuclear issues and supports a comprehensive solution to this issue through practical programs.

The Indian prime minister welcomed the signing of the agreement by India and Pakistan agreeing not to attack each other's nuclear installations and said it has proven extremely effective. He said: Now, we are expecting its ratification and desire subsequent steps that will reduce tension in the region. [passage omitted]

**Top Scientist on 'Peaceful' Nuclear Program**

*BK1207092189 Hong Kong AFP in English  
0858 GMT 12 Jul 89*

[Text] Islamabad, July 12 (AFP)—Pakistan is capable of building more uranium enrichment facilities, but its nuclear programme is strictly for power generation, the country's chief atomic scientist has said.

In an interview with the defense journal, Abdul Qadir Khan said Pakistan could build many more nuclear facilities like the well-guarded plant at Kahuta 20 kilometres (12 miles) east of here. "We conceived it, we designed it, we built it and we are running it successfully," he was quoted as saying.

He said the nuclear enrichment technology used at the plant was 10 years ahead of India's, adding that only eight countries in the world could enrich uranium with the ultra-centrifuge method used at Kahuta. But the

scientist said the enriched uranium produced at the plant was "mainly meant for making fuel for light water reactors."

The sophisticated technology kept the plant "totally self-reliant and safe from political pressure and blackmail," the monthly journal quoted Dr Qadir Khan as saying.

"I know for sure that Indians had been trying very hard for the last 15 years to master this technology and have not yet succeeded," he said.

India exploded a nuclear device in 1974, and each of the two sub-continent neighbours suspects the other of having programmes to develop nuclear weapons.

Dr Qadir Khan reiterated Pakistan's denial of charges by some Western countries, India and Israel that the country's nuclear programme was aimed at making weapons.

He said the "myth of a Pakistan bomb" was "all fiction and a creation of the minds of the anti-Pakistani lobby."

"All our efforts in this field are aimed at producing nuclear power," he said. "I have not been asked to do otherwise."

The scientist did acknowledge, however, that his nuclear project was supplying the military with some modern weapons. "We have been supplying the Armed Forces with surface-to-air, anti-aircraft shoulder-fired missiles, special anti-tank ammunition and multi-barrel rocket launchers and helped [develop] laser range-finders," he said.

Dr Qadir Khan said he was disappointed Pakistan had not developed light-water nuclear reactors.

When Kahuta was first built in the late 1970s, his team had hoped that by the time it started producing enriched uranium Pakistan would have its own light-water reactors to use the fuel. "This unfortunately has remained a dream," he said. "If we had light-water reactors we would be saved from so much insinuation and doubts about our peaceful nuclear programme," he said.

The scientist added that it was technically possible to build light-water reactors in Pakistan.

"Why we don't go ahead? Well we can do only those things which the government asks us to do," he said. "We can't initiate anything on our own."

### **Builders Defend Seismic Safety of Armenian Power Plant**

51000002a Moscow STROITELNAYA GAZETA in Russian 22 Feb 89 p 2

[Article by the Department of Scientific and Technical Progress of STROITELNAYA GAZETA: "A Wave of Incompetence. The Builders of the Armenian Nuclear Power Plant Against Rumors and Conjectures"; first paragraph is STROITELNAYA GAZETA introduction]

[Text] In recent months intense attention to any information from Armenia has become for us an ordinary state. Any fact, which testifies that life is gradually resuming its natural course, gladdens and encourages us. And suddenly...a report (the newspaper IZVESTIYA of 8 February 1989, the article "We Are Paying the Bills of Stagnation"), which upsets minds and hearts and returns our memory to a catastrophe that is even more terrible and tragic: when designing the Armenian Nuclear Power Plant, the only one in the country that is located in an earthquake zone, the seismicity factor was not taken into account at all.

Today it is possible to believe that this plant as a nuclear plant has ceased its existence—the decision on its shut-down and conversion to a conventional thermal power plant has been made. On 25 February its first unit will be shut down, on 18 March the second one will be shut down. But, you will agree, it is impossible to pass this unprecedented fact over in silence, even if you make allowances for the fact that the Armenian Nuclear Power Plant was built during "the period of stagnation." And the editorial board of STROITELNAYA GAZETA considered it necessary to turn to specialists for explanations.

Candidate of Technical Sciences V. Tatarnikov, chief engineer of Atomenergoprojekt:

"They designed the Armenian Nuclear Power Plant at the Gorkiy Affiliate of our institute, which at that time was called the All-Union State Institute for the Planning of Electrical Equipment for Heat Engineering Structures. The plant from the very start was designed for a 9-point earthquake. And it could not be otherwise. And not only because back in 1962 (and they began to build the Armenian Nuclear Power Plant in 1969) the designers used the norms that were specified by Construction Norm and Regulation II-A.12-62 of the State Committee for Construction Affairs for construction in seismic regions."

The building of a nuclear power plant is an extremely complicated, critical, and very specific job. And at all plants, especially at the Armenian plant, we used and are now using not only domestic, but also world know-how. First of all of the United States and Japan. When selecting sites we also enlist the world data bank on earthquakes. The reference in the article of IZVESTIYA to the fact that the geological base of the Armenian Nuclear Power Plant dampens a 1-point earthquake,

additionally testifies: in this dangerous zone the site was chosen correctly. And the 1971 reports of the Gorkiy Department of the All-Union State Institute for the Planning of Electrical Equipment for Heating Engineering Structures, "Measures on the Assurance of the Seismic Stability of the Armenian Nuclear Power Plant With Series-Produced VVER-440 Power-Generating Units," and of the Central Scientific Research Institute of Structural Components imeni Kucherenko, "The Design Seismic Load on the Technological Equipment and Piping Systems of the Armenian Nuclear Power Plant," also testify to what enormous, careful work was performed in advance for the protection of this plant against an earthquake.

Doctor of Technical Sciences Yu. Ambriashvili, deputy director of the Moscow Department of Atomenergoprojekt:

"What we actually encountered for the first time at the Armenian Nuclear Power Plant is the problems of the earthquake protection of technological equipment. Whereas at civilian industrial facilities some experience of earthquake-resistant construction, on which it was possible to rely, having adjusted it, of course, with allowance made for the specific nature of nuclear power plants, had already been gained, here, in domestic science, we discovered many 'blank spots.' And precisely at the Armenian Nuclear Power Plant for the first time in domestic practice we elaborated methods of protecting all the instruments and equipment, which are vitally important for the nuclear power plant, against an earthquake. In 1971 a laboratory of the seismic stability of nuclear power plants (now, incidentally, it is also a department of Atomenergoprojekt) was organized within the scientific research sector of the All-Union Scientific Research Institute of Planning of Hydro-projects imeni S.Ya. Zhuk. On stands, which simulate an earthquake of more than 10 points, we 'thoroughly shook' all the apparatus, checking it for 'breakdowns' under various extreme conditions. We remodeled and reinforced everything that caused doubts. We purchased in Japan specially for the Armenian Nuclear Power Plant about 200 hydraulic shock absorbers for the protection of the most critical assemblies—the reactor, the steam generator, the piping systems, and the pumps. We installed not only domestic, but also American earthquake protection equipment. We also continued testing in the process of installation. And only after this did we start up the plant."

The work begun at the Armenian Nuclear Power Plant marked the beginning of an entire direction in domestic science, which studies the problems of the earthquake protection of nuclear plants. Starting in 1970 an extensive program of basic research in this field was conducted under the direct monitoring of the Interdepartmental Commission for Seismology and Earthquake-Resistant Construction attached to the Presidium of the USSR Academy of Sciences. Computer complexes, which make it possible to calculate the strength and the nature of the oscillation of all the critical structural



components and technological systems in case of the strongest earthquakes, were developed in the process of implementing the program. For the comparison and specification of the theoretical and full-scale data tests were conducted at not only the Armenian, but also the Kola, South Ukrainian, Rovno, and other nuclear power plants. An earthquake testing complex, which simulates a 12-point earthquake and on which all the most important equipment of nuclear plants is now tested, was developed for the first time in domestic practice.

R. Minasyan, chief hydraulic engineer of Atomenergo-proyekt:

"As for the process water supply system, which, as has been reported, is designed for shocks of smaller force than the reactor is, it should be specified: About which system is it a question? At the Armenian Nuclear Power Plant there are two reactors and four turbines, which generate current. Accordingly, there are also two process water supply systems. If the one that cools the turbines breaks down, this is unimportant for the safety of the nuclear power plant, inasmuch as the turbines are in the second loop, which is uncontaminated by radiation. While the second system is designed for the same seismic stability as the reactors themselves. Each reactor has three piping systems, which will ensure the delivery of water to the reactor department in any emergency situation, including in case of the complete cutoff of power to the station. In this case diesel generators will provide the pumps with the necessary electric power. So that 300-percent reliability has been ensured here."

O. Smirnov, chief heat engineer of Atomenergo-proyekt:

"I would like to emphasize that a reactor is not drenched with water like a burning house, but is cooled in two ways. First the reactor control system, which halts the nuclear reaction in a few seconds, turns on automatically. And the heat, which is given off by the reactor and is measured in kilocalories, 5 minutes after the halt of the reaction decreases to 1 percent of the initial quantity. It is this residual heat, which is retained by the heated metal, that the process water supply systems remove."

"Thus, the Armenian Nuclear Power Plant from the very start was seismically a rather well-protected plant," V. Tatarnikov summarizes. "Moreover, the earthquake of 7 December 1988 confirmed the correctness of the adopted design decisions. For there are 26 seismometric stations at the main structures of the nuclear power plant. At the moment of the earthquake they registered shocks at the plant site of about 6 points. And although the wave proceeded from the epicenter in the most unfavorable direction for the nuclear power plant, the plant operated normally. On 20 December specialists of Atomenergo-proyekt and the American Bechtel company (the largest designer of nuclear power plants), which is also studying the questions of earthquake protection, visited it. They checked the designs, components, and equipment and compared them with their own approaches and solutions. And they did not express

doubts about the seismic stability of the plant. The remarks that they did make had already been taken into account by us in the plan of modernization."

It is strange that these data are unknown to Comrade Vartanyan, the current director of the Armenian Nuclear Power Plant, who, relying not on scientifically reliable information, but, to all appearances, on conjectures and rumors, misled both correspondents and such a recognized newspaper. The fact is truly unprecedented and distressing, especially under present conditions, when waves of conjectures and rumors as it is are sweeping over Armenia.

#### **Armenian Nuclear Power Plant Director on Shutdown**

51000002b Moscow STROITELNAYA GAZETA in Russian 26 Feb 89 p 1

[Interview with Migran Vartanyan, director of the Armenian Nuclear Power Plant, by STROITELNAYA GAZETA special correspondent M. Martirosyan under the rubric "Fact and Commentary" (Settlement of Metsamor, the Armenian SSR): "The Armenian Nuclear Power Plant: The First Power-Generating Unit Has Been Shut Down"; first four paragraphs are STROITELNAYA GAZETA introduction]

[Text] In the republic they waited impatiently for the shutdown of the Armenian Nuclear Power Plant. They waited, because the plant is 25 kilometers from Yerevan, the number of residents of which already exceeds 1.2 million.

Not to mention the fact that 460,000 people live in the Ararat Valley, the breadbasket of the republic, where the nuclear power plant is located.

And then yesterday, 25 February, at 1200 Moscow Time, they began the discharging and shutdown of the first power-generation unit of the nuclear power plant with a power of 407.5 megawatts. The shutdown lasted approximately 5 hours.

The day before late in the evening I met with plant director Migran Vartanyan.

"The plant will not die," he said, "for a substation of our nuclear power plant is the largest in the system of the Armenian SSR Main Production Administration of Power and Electrification. And in order to maintain the necessary level of voltage in the power network, as well as to reduce the losses, the synchronized operation of generators without turbines is necessary. That is why our substation is feeding reaction power into the electric network."

[STROITELNAYA GAZETA] After the complete shutdown of the plant the problem of finding jobs for a large number of people will arise, how will this problem be solved?

[Vartanyan] If it does arise, it will not be soon: for 3 years the fuel will remain in place. Hence, personnel are needed for the assurance of the removal of the fuel and the shutdown cooling of the spent fuel.

[STROITELNAYA GAZETA] How dangerous is it to leave the fuel in place? I have in mind the ecological aspect.

[Vartanyan] It is not dangerous. Take a look: the permissible rate of air emissions in case of the full loading of the plant is 1,000 curies a day. While our latest data are 4.5, 6.2, and 5.1. I believe that no comment is needed.

[STROITELNAYA GAZETA] At the Armenian Nuclear Power Plant, as far as is known, there is an automatic system of earthquake protection. How did it work on 7 December?

[Vartanyan] It did not, inasmuch as the automatic equipment operates at 6 points, while here there were only 5.5 points. Moreover, the plant was designed for 9 points. And during the earthquake not one pane in the windows cracked....

You know, there are many different opinions on irradiation. I want very much for your readers to familiarize themselves with the small book published in 1988 by the Mir Publishing House with the title "Radiatsiya, dozy, efekty, risk" [Radiation, Doses, Effects, Risk] (a translation from English). Thus, according to data of the United Nations, it turns out that a person is exposed to significantly more radiation even in his bathroom (!), indeed, precisely in the bathroom, in the kitchen, and at the polyclinic than from emissions of nuclear plants. Different kinds of rumors originate for one reason: people do not have information. Hence, by creating an atmosphere of secrecy around certain data, we ourselves give rise to these rumors. Glasnost is required.

In conclusion I will say: nuclear power engineering is needed, there is no alternative to it. They are shutting down our plant due to the proximity of a tectonic fault. During tests the plant withstood 9 points, but the force of the earthquake was greater than 10 points....

#### **Finnish Paper Polls Moscow, Helsinki Dwellers on Nuclear Views**

51002431b Helsinki HELSINGIN SANOMAT in Finnish 28 May 89 p B2

[Article by Unto Hamalainen: "Environment Tax Approved in Helsinki and Moscow"; first paragraph is HELSINGIN SANOMAT introduction]

[Text] A HELSINGIN SANOMAT Gallup poll has demonstrated that people are prepared to make sacrifices.

Residents of Helsinki and Moscow feel that the condition of their environment has been worsening these past few years: 88 percent of Moscow residents and 86 percent of Helsinki residents believe that this has been happening in the 1980's. Only 4 out of every 100

Helsinki residents and 2 out of 100 Muscovites feel that their environment is in better condition than at the start of the decade.

This information was revealed by a HELSINGIN SANOMAT Gallup poll in which Helsinki residents and Muscovites' impressions of their environments and alternatives for the production of energy were polled. The same questions were asked simultaneously in Helsinki and Moscow in a Gallup poll conducted in mid-May. A similar opinion poll had not been conducted previously.

Muscovites are unequivocally dissatisfied with the condition of their environment. Fully 91 percent of all Muscovites declared that they were very or rather dissatisfied with the state of the natural environment and the environment in the Soviet Union.

In Helsinki opinions were split: Half were satisfied and the other half dissatisfied. In Moscow both the young and the old were dissatisfied. In Helsinki old people were the most dissatisfied of all.

Residents are prepared to make sacrifices so that their environment and the natural environment may be preserved.

Capital city residents' attitudes were polled with the following question: "If views on nature conservation and environmental protection should conflict with views on economizing and employment when making important decisions, which, in the final analysis, is, in your opinion, more important: protection of nature and the environment or economizing and employment?"

Seventy-four percent of the Muscovites and 71 percent of the Helsinki residents place protection of nature and the environment before economizing and employment.

Only 18 percent of the Helsinki residents and 10 percent of the Muscovites place economizing and employment before environmental protection. Eleven percent of the Helsinki residents and 16 percent of the Muscovites could not rate these two alternatives.

#### **United on Environment Tax**

People are also prepared to offer money out of their own pockets for environmental protection. Just these past few weeks there has been animated discussion of a tax on the environment in Finland. A tax to be imposed on polluters—which ordinary consumers would also have to pay for through prices—is such a new thing that there has not yet been time to poll support for it.

Sixty-eight percent of the Helsinki residents view an environment tax favorably. Especially those in the 15-to-24-year age bracket are ready to approve an environment tax. With increasing age willingness to pay declines.

In Moscow 75 percent of the residents support an environment tax. In Moscow also young people are more prepared to approve the new tax than older people are.

Women are most worried about the future of the environment. In both capitals they are also more prepared than men to give up economic efficiency and to pay an environment tax as well.

In the poll people's gaze was also directed from their own backyards to the wide, wide world. The respondents were asked: "Which of the following three issues will, in your opinion, be the biggest environmental problem of all in the world if we think of the matter in terms of the next 10 years: the disappearance of natural resources, damage to earth's atmosphere, or the extinction of animal and plant species?"

Damage to the atmosphere was very much at issue at just the time the poll was taken since two international conferences on the ozone problem had been organized in Helsinki. Among others, a recommendation was approved at the Environment Ministers Congress to reduce the use of freons, which destroy the atmosphere.

Damage to the earth's atmosphere was raised to the top of the list of threats [the world is facing] by 62 percent of the Helsinkians and 63 percent of the Muscovites.

Sixteen percent of the Helsinkians and 13 percent of the Muscovites fear the disappearance of natural resources most.

The extinction of animal and plant species is considered to be the biggest environmental problem by 18 percent of the Helsinkians and 10 percent of the Muscovites.

Soviets are even more concerned about the atmosphere than Finns are. Seven percent of the Muscovites feel that damage to the atmosphere "is an especially big problem." Only less than a third of the Helsinkians consider it to be that big a problem.

#### **Divided on Nuclear Power**

While residents of the two neighboring countries are united by their ideas on the environment, they are divided on nuclear power.

Most of the Helsinkians, 71 percent, consider nuclear power plants to be quite or fairly safe. As recently as last fall the number of people who had faith in them was decidedly lower. In a HELSINGIN SANOMAT Gallup poll conducted in September, 53 percent of the capital's residents thought that nuclear power plants are safe.

In Moscow only less than a fourth of the city's residents, 24 percent, have faith in the safety of nuclear power plants. Only 1 out of 100 considers them to be quite safe. Most of Moscow's residents, 72 percent, said that these power plants are not safe.

According to an old notion, young people are the ones who most zealously oppose nuclear power—the youth organizations, among others, have, after all, been active in the various movements that oppose nuclear power.

The poll does not support this notion. In Helsinki 72 percent of the 15-to-24-year-olds consider nuclear power plants to be safe. Only 55 percent of the pensioners have that much faith in nuclear power.

In Moscow the 15-to-24-year-olds consider 32 percent of the nuclear power plants to be safe, but the pensioners only 17 percent. In both cities women are clearly more opposed to nuclear power than men are.

Just before the poll there had been a discussion of the safety of nuclear power plants since 3 years had elapsed at the end of April since the Chernobyl explosion. The many newspaper articles and radio and television programs brought back into people's minds the effects of the nuclear power plant explosion on the natural environment and on people.

The construction of additional nuclear power plants has also been a subject of discussion in both countries. In Finland we have been pondering whether we ought to build a fifth nuclear power plant. Industry, the government's prime minister, and the trade and industry minister spoke out in favor of a new nuclear power plant just as the poll was being conducted.

The majority of capital residents do not support the building of new nuclear power plants. In both cities 54 percent of the residents oppose additional construction. The percentage points in Helsinki for and against nuclear power are, however, closer to being even than they are in Moscow. In Helsinki 44 percent support a new nuclear power plant, but in Moscow only 36 percent.

A clear majority of Helsinki men, 60 percent, are prepared for us to build a fifth nuclear power plant. Young men in particular back nuclear power. The same situation is also evident in Moscow.

Muscovites' abhorrence and fear of nuclear power are also evident when they have to rate coal versus nuclear energy. Even though the use of coal messes up the environment, Muscovites are prepared to tolerate even that if the use of nuclear power plants is abandoned. Older Muscovites in particular are in favor of coal.

In both cities the following question was asked: "Nuclear energy and coal are often contrasted with one another in the discussion of energy production. Supposing it should be decided to build a power plant near where you live and there were two alternatives to choose from, which raw material would you prefer: nuclear energy or coal, or would either alternative be the same to you?"

Forty-six percent of the Muscovites preferred coal to nuclear energy and 22 percent placed nuclear energy first. Five percent rated them equally and 27 percent of those polled could not answer the question.

In Helsinki the percentages were even: 36 percent considered nuclear energy to be a better alternative than coal and another 36 percent placed coal before nuclear

energy. Twenty-three percent considered them to be equal and 4 percent of those polled could not answer the question.

On 14 and 18 May the Finnish Gallup Company interviewed 603 Helsinkians and on 12 and 19 May the Soviet Academy of Science's Institute of Sociology interviewed 600 Muscovites. The interviews were conducted by telephone. In both cities the respondents represent the population 15 years of age or older.

#### This Is How They Answered in Helsinki and Moscow

[The following are the questions asked in the poll and the responses to them; figures are percentages of poll sample.]

"When you think of the state of the natural environment and the environment in our country, are you: very satisfied, fairly satisfied, rather dissatisfied, or very dissatisfied?"

Response	Helsinki	Moscow
Very satisfied	2	1
Fairly satisfied	47	7
Rather dissatisfied	38	56
Very dissatisfied	11	35
Cannot say	1	1

"Suppose that a special environment tax imposed on both individual citizens and communities were to be introduced in our country, all of the proceeds of which were to be used to improve the quality of the environment and protect the natural environment. How do you feel about this sort of environment tax and do you view it as being: very positive, fairly positive, rather negative, or very negative?"

Response	Helsinki	Moscow
Very positive	14	16
Fairly positive	54	59
Rather negative	21	16
Very negative	9	4
Cannot say	3	5

"Different views have been presented on how the production of electricity should be developed. One alternative is to build more nuclear power plants. How do you feel about the construction of additional nuclear power plants in our country and do you view it as being: very positive, fairly positive, rather negative, or very negative?"

Response	Helsinki	Moscow
Very positive	11	3
Fairly positive	33	33
Rather negative	35	39
Very negative	19	15
Cannot say	2	10

#### Committee Directs Propaganda Campaign Promoting Nuclear Power

51002431a Helsinki HELSINGIN SANOMAT in Finnish 30 May 89 p 29

[Article by Heikki Arola: "Post-Chernobyl Atmosphere of Concern to Officials; Moscow Information Center Puts Out Propaganda for Nuclear Power"]

[Text] Moscow, Zaporozhye—The Soviet Union is one of the three countries whose extensive nuclear power program has not swerved from its course despite accidents. The two others are France and Japan.

The opposition to nuclear power that arose in the Soviet Union too after Chernobyl is certainly of concern to officials. Moscow has just set up an information center whose job it is to "distribute to the public objective information on nuclear power."

While the Soviet nuclear power program is fundamentally the same as before Chernobyl, it has had to be trimmed. A good example of these cutbacks is the Zaporozhye nuclear power plant located in the Southern Ukraine.

According to the original program, Zaporozhye was supposed to get eight 1,000-megawatt power plant units. The plant would thus have been one of the biggest nuclear power plants in the world.

At the present time four units have been completed and are in operation and two are being built. Construction of the seventh and eighth units has been abandoned and, according to the plant's chief engineer, Taras Plokhii, the decision is final and has been confirmed by the central administration in Moscow.

The decision to trim production was not made due to the pressure applied by the Green movement, which has recently become active in the Soviet Union, but because new, stricter regulations governing nuclear power plant sites have been issued since the Chernobyl disaster.

All planned, but not yet built nuclear power plants now have to be reexamined. Decisions to trim operations have been and will be made elsewhere than at Zaporozhye as well.

According to the latest reports, 26 reactors with a combined capacity of 21,000 megawatts are now under construction in the Soviet Union. Fifty-six reactors are in operation with a capacity of 33,000 megawatts. The construction of at least five reactors has been abandoned.

In the case of Zaporozhye, no new plants can be built any more because the plant is located too close to the artificial lake of Kakhorsk. According to the new rules, the distance from the shore must be at least 2 km; at Zaporozhye it is only a few hundred meters.

Chief engineer Taras Plokhii said that the locally active Green movement is now demanding that the whole plant be shut down, appealing on the basis of the new regulations governing location.



The law is not, however, retroactive, nor can there be any question of a shutdown for economic reasons. Nor is the Zaporozhye plant in glaring violation of the new rules. "If an old plant in no way fits into the new framework, it must, of course, be shut down," Plokhii expressed his opinion.

#### **Built in Record Time**

Aside from being one of the world's biggest power plants, Zaporozhye apparently holds the record for speed of construction.

The power plant units are mass-produced on the assembly-line principle just like cars. Each stage of construction has its own specialized construction team which moves on to the next unit when it has finished its work on the last one. Several units are built at one time.

Construction of the Zaporozhye plant was begun in late 1979 and early 1980. The first unit went into operation in 1984 and the next three units at constant intervals of 1 year. They are right now preparing to load the fifth unit with fuel and it will go into operation this summer. The sixth unit will go into operation next year.

Zaporozhye is the first Soviet plant in which all the reactor units are the same standardized, mass-produced model. The reactors are 1,000-megawatt, pressurized-water reactors which are made by an Atommash workshop located in Volgograd.

#### **Chernobyl Influenced Training**

Chief engineer Plokhii said that the rapidly paced construction did not have a negative effect on safety dispositions: The safety systems meet international requirements.

For the first time the Soviet Union is soon to allow an International Atomic Energy Agency (IAEA) inspection team on its soil to verify this. Zaporozhye will probably be among its first objectives.

Plokhii said that the Chernobyl disaster did not lead to any technical changes at the Zaporozhye plant because it is a different type of plant than Chernobyl was.

"Technically, the Three Mile Island accident in the United States was closer to us but, since it happened in 1979 and we began to build later, we could take into account all of the experience gained from it."

According to Plokhii, Chernobyl had an effect on the training of personnel. After the accident, two training phases for the personnel were organized in Zaporozhye and shift foremen and plant managers in addition received special training in Moscow.

The rise of the ecological Green movement and the concern of the people who live in the vicinity of the plants has forced them to take note of environmental issues in Zaporozhye.

Among the Soviet power plants, Zaporozhye is a special case because there are in the vicinity of the 6,000-megawatt nuclear plant eight power plants that use fossil

fuels and whose combined electric power capacity is 3,400 megawatts. It is one of the biggest concentrations of power plants in the world.

Environmental pressure has already led to the fact that two 800-megawatt plants that used to burn oil have switched to cleaner natural gas. The others burn coal.

With scientific research institutes they are now launching a broad observation program through which the effect of the plants on people, animals, plants, and the air will be studied within a radius of from 30 to 50 km from the plants. Plokhii considers the study that has been initiated to be unique.

The plant has begun to organize public sessions in the vicinity and regularly publishes and distributes a newsletter containing other information, whose press run they intend to increase from 1,500 to 10,000.

Radiation norms were also changed in the Soviet Union after Chernobyl. According to Plokhii's assurances, the volume of radiation that has been getting into the environment from the plant since the new norms have been in effect is 1,000 times lower than the highest permissible level.

#### **Information Apparatus Seeks Model in West**

The Soviet State Committee for Utilization of Atomic Energy in Moscow is right now setting in motion an information organization whose goal is to "distribute objective information on nuclear power to the public" through publications, public sessions, and the news media.

An organ composed of members of different state agencies like the Environmental Protection Committee, the Ministry of Health, the Academy of Science, and Soviet television and radio directs information activities. The central organ has under its jurisdiction several committees and teams composed of local officials that work in conjunction with plant management and which are located close to the nuclear power plants.

According to Boris Kuvshinnikov, a deputy chairman of the State Committee for Utilization of Atomic Energy, great importance is attached to information activities. Information activities should, in his opinion be characterized by glasnost. Matters are discussed with opponents, radiation reports are made public, and nuclear power plants are open [to the public]. The Committee is particularly interested in how corresponding information activities are handled in the West.

The State Committee does not know how opinions are divided for and against nuclear power in the Soviet Union. No scientific opinion polls have been conducted. The Committee plans to correct this deficiency by conducting fairly extensive studies at three nuclear power localities this summer.

The Committee leaders described the opposition to nuclear power as being of two kinds: There is local

opposition, which is aimed at individual plant projects. And, on the other hand, there are the nationally known public opponents, generally journalists or writers.

White Russian writer Aleks Adamovich, who is especially known for his irritating attacks on officials, was mentioned specifically in the Committee.

He has sharply criticized the handling of the aftereffects of Chernobyl in the press. In LITERATURNAYA GAZETA Adamovich recently reported on a cloud of pollutants moving from Chernobyl toward Moscow which was shot down with chemicals somewhere in White Russia. Now the inhabitants would like to move away from those areas, but permission has not been granted, Adamovich wrote.

Locally, there has been opposition in Armenia, where the plant was shut down after the earthquake. The expansion of Ingalina in Lithuania has been vehemently opposed. There has also been strong opposition in the Crimea and Khabarovsk, where construction has not yet begun.

#### **Reactor of the Near Future Will Be Pressurized-Water Type**

The technological future of nuclear power in the Soviet Union is still in part veiled in obscurity. The direction the technological policy will take is at present being pondered and people involved in nuclear power expect decisions over the next few years.

At the present time two types of reactor are relied on in the Soviet Union, of which the basic type is the VVER-1000, a 1,000-megawatt pressurized-water reactor. The other type is the graphite-moderator RMBK type used at Chernobyl.

Since the graphite type has fallen into disfavor, the reactor of the near future will be based on a pressurized-water reactor, which will be manufactured at the giant Atomnash plant in Volgodonsk. To further develop the reactor, two projects are in progress, the VVER-88 and VVER-92 projects, in which the Imatra Power Company in Finland is participating.

In the more distant future the Soviet Union may switch to a gas-cooled reactor for safety reasons. These reactors would be assembled through a modular technique and the capacity of one bank of reactors would be at least 100 megawatts.

Chief engineer Taras Plokhii is not particularly convinced of [the efficacy of] gas reactors. He feels that experience has shown pressurized-water reactors to be reliable: "The best is the enemy of good."

The object of the projects to develop pressurized-water reactors that are in progress is to improve both reactor safety and economy of use and construction.

On the VVER-88 project the main emphasis is on safety, on the VVER-92 project on economy.

The new reactors are protected against a power outage lasting 24 hours. The number of control rods has been doubled to make control more effective. They are trying to reduce the number of welded seams to a minimum and to eliminate welded seams from the reactor core.

A core meltdown is guarded against by making an opening under the reactor, the purpose of which is to seize the core in the event of an accident. The development effort is along the same lines as in the West.

#### **Nuclear Power May Reduce 'Greenhouse Effect'** *18220160n Moscow TRUD in Russian 12 Jul 89 p 3*

[Interview with Hans Blix, general director of the IAEA, by I. Belov: "A Realistic Alternative. Nuclear Power Engineering Is Slowing the Growing Threat From the 'Greenhouse Effect'"]

[Text] The problems of nuclear power engineering are worrying millions of people throughout the world. The most varied and sometimes contradictory opinions are expressed: some favor its further development, others are for halting the construction and even the operation of AES's [nuclear power stations]. In an interview with a TRUD correspondent the general director of the IAEA [International Atomic Energy Agency] Hans Blix shares his own viewpoint on nuclear power engineering today and in the future.

[TRUD] How do you characterize the present situation in nuclear power engineering in the world?

[Blix] The more than 5,000 reactor-years of operation that have now been accumulated in the world represents a considerable industrial experience. I venture to assert that the service safety record of nuclear power engineering is just as good as the records for the sectors that generate electricity using coal, oil, gas and hydropower. It nevertheless remains a fact that the accidents at the Three Mile Island (in the United States) and Chernobyl AES's confirmed many people's misgivings about nuclear power engineering. Only many years of AES operation everywhere without serious accidents will remove the public skepticism.

The approximately 430 AES's now being operated throughout the world account for 16 percent of world electricity generation. The statistics available to the IAEA indicate that the overall indicators for world nuclear power engineering are constantly improving. The operational readiness of AES's is growing, the number of unscheduled shutdowns is being reduced, and the radiation dose is falling. Before Chernobyl, and since, there has been no accident in which people were killed.

Of course, as before major differences exist in the economic indicators for AES's, and for unscheduled shutdowns and levels of radiation doses. But these differences are connected not with the types of reactor used but primarily with the quality of management and operation.



[TRUD] What is being done to improve precisely these avenues of AES operation?

[Blix] The governments of the IAEA member states are concerned not only with developing energy but also establishing the conditions in which AES's can be operated in each particular country. Accordingly the IAEA, which does not itself operate any AES's is, in addition to questions of the efficient and economical operation of nuclear power stations, engaged with many other problems, including approval of the so-called nuclear safety standards.

But responsibility for achieving this end rests primarily with those who work at the AES's. All elements of the global network of operators should be sound and reliable. This is precisely why they decided in mid-May to unite themselves here, in Moscow, in a World Association in order to learn from each other and achieve in practice universal compliance with the safety standards. This exchange of experience, which is being conducted within the IAEA framework at the level of government officials, leading experts and scientists, will thus be supplemented by the extension of operational and direct contacts between people working in the equipment halls of nuclear power stations.

[TRUD] After decades of silence, scientists and the mass media are talking increasingly about the problem of the "greenhouse effect." What do you think about this problem?

[Blix] Until now the rapid growth in industrial development in many countries has been taking place through enormous increases in the scales on which hydropower and the fossil types of fuels are used—coal, oil, gas. Over time it has become obvious that this has caused local damage first and foremost to rivers and cities, and harm has also been inflicted on forests and lakes. And we recently discovered that the enormous emissions of carbon dioxide, formed in the combustion of all kinds of fossils fuel, is almost 50-percent responsible for the "greenhouse effect."

This is a real threat to the world in which our children and grandchildren will live. It is quite rightly attracting increasing attention from scientists, political leaders and the mass media.

[TRUD] What steps can be taken to counteract global warming?

[Blix] One essential step is already being taken. In accordance with an agreement recently reached, during the next decade the use of hydrofluorocarbons, which, it has been established, are the cause of the destruction of the Earth's ozone layer, "guaranteeing" about 20 percent of the "greenhouse effect," will be halted.

But the main attention must be focused on emissions of carbon dioxide. These emissions cannot be prevented with the help of technical devices but only reduced by restricting the combustion of coal, oil, and gas.

Moreover, additional scientific research is needed to clarify what amounts of emissions of carbon dioxide into the atmosphere may be considered permissible. However, we might take under advisement the conclusion of a conference on changes in the atmosphere that was held in Toronto last year. This conclusion is that we should set a target of a 20-percent reduction in present levels by the year 2005. Since the present volume of emission is about 20,000 million tons annually, in line with this proposal it should be cut by about 4,000 million tons.

[TRUD] The advocates of environmental protection suggest a combination of more efficient and better-considered use of energy, and also the development and use of renewable energy sources, such as wind power or solar energy. What is your opinion on this score?

[Blix] These proposals deserve attention and support but they are inadequate as answers to the question of how we shall reduce carbon dioxide emissions on a global scale. I am certainly not in any position to propose that this may possibly be done through the use of nuclear power engineering. However, I nevertheless do assert that the use of nuclear power engineering is helping us to avoid the burning of a considerable quantity of fossil fuels. In the modern world nuclear power engineering is still the only real alternative to an increased "greenhouse effect."

#### **Nuclear Safety Discussed by Supreme Soviet**

##### **Malyshev on Nuclear Power Policy**

*LD1407223189 Moscow Television Service in Russian  
1426 GMT 14 Jul 89*

[Statement by Vadim Malyshev prior to his reappointment as head of the State Committee Supervising Safety in Industry and the Nuclear Power Sector at the 14 July USSR Supreme Soviet joint session in the Kremlin—recorded]

[Excerpts] [Passage omitted] I have been asked to assess the state of reactor No 4 at Chernobyl and of the nuclear electric power station as a whole in the matter of safety. Comrades, reactor no. 4 in its present state is something unique. There has never been anything like it in the world before, and I very much hope that there never is anything like it again. I hope that this remains for many years as a monument to slovenliness and criminality, so to speak. Anyway, its status is being closely monitored. Our inspectors are taking part in coordinating the work programs, and we have no fears of anything else happening there. There are individual matters connected with the structure's stability and the relevant questions have been asked in this respect. We are keeping a watch on this matter. At any rate, one cannot say today that everything there is in order, because we fully realize that that facility has to be preserved in its present state for more than just 1, 5, or perhaps even 10 years. And that is why there is a special group from the Kurchatov Atomic Energy Institute at work there. The institute is working to ensure both complete safety and the absence of any radiation leakage. [passage omitted]

It must be frankly stated, comrades, that the problem of atomic waste disposal has not been fully solved. It has not been solved in any country. But I am not saying this to try and reassure you; I think that this is work that is being done and that must be completed. It is another matter that radioactive waste disposal today is scattered amongst various departments. In our country at the moment, to a certain extent, the situation regarding the disposal of various kinds of isotope sources is insufficiently monitored—in our view, that is—because this disposal is being done in each region and oblast by the relevant municipal services and others as well. A more serious attitude in this respect is displayed toward highly active waste, which is generally stored at enterprises of the former Ministry of Medium Machine Building. There are also storage facilities for low-activity waste, which is reprocessed by combustion or solidification, and these facilities are at the stations. I think that we will have problems here, but they are not of the kind that will put a stop to atomic energy.

#### **Shcherbak Questions Nuclear Safety**

*LD1507101689 Moscow Television Service in Russian  
1433 GMT 14 Jul 89*

[Remarks by Deputy Shcherbak on the candidacy of Vadim Mikhaylovich Malyshev for the post of chairman of the State Committee for the Supervision of Work Safety in Industry and Nuclear Power Engineering during the 14 July USSR Supreme Soviet joint session in the Kremlin—recorded]

[Excerpt] [Passage omitted] Tasks of vital importance face the new committee in the sphere of ensuring safety in the nuclear power industry. The absence, as of now, of legislation regulating the activity of the nuclear power industry has led to the unconditional fulfilment of all state plan indices being placed above safety. As a result, planning and design organizations, manufacturing plants, and construction and assembly organizations do not bear responsibility for the complexes that they create. There are considerable lags behind the international level in planning, construction, and operation of nuclear power stations.

The Committee on Ecological Issues, which I have the honor of representing here, puts the problem on a much wider scale: We want not merely the creation of a law on nuclear power, but on nuclear safety. Despite all the improvements to the Chernobyl-type RBMK reactor after 1986, it unfortunately continues to pose a nuclear danger as a result of design inadequacies. It is known that if two conduits break while working at capacity a very serious accident may occur.

Incidentally, now, as a result of mistakes made during repairs, the taking up to capacity of the first block has been delayed.

The problem of the fourth damaged block of the Chernobyl power station demands a solution, taking into account the presence of cracks in the old structure. I

would like the new committee and Comrade Malyshev to radically solve the problem of fully stopping the Chernobyl nuclear power station, considering its increased danger on a global scale. Carthage must be destroyed. Our country simply will not stand another Chernobyl. Moreover, even now safety regulations with regard to the location, planning, construction, and operation of nuclear power stations are often ignored. I will give one example: The town of Nikopol, in Dnepropetrovsk Oblast, with a population of 160,000, is 10 km from the Zaporozhye nuclear power station, which is not in accordance with the safety norms ratified by the USSR Council of Ministers on 14 October 1987. According to these norms, the site of a nuclear power station cannot be closer than 25 km to a locality with a population of more than 100 people. According to these same norms, the combined capacity of a nuclear power station is restricted to 8 million kilowatts. With the commissioning of the sixth reactor, and taking into account the Zaporozhye state regional electrical power station's 3.6 million-kilowatts capacity, a colossal 9.6 million-kilowatt capacity will be concentrated in a tiny area on the very banks of the Kakhovka reservoir, a source of drinking water for millions of people.

Should we not stop and think: What are we doing? Why put such a dangerous genie in a fragile bottle? The issue of the waste from the nuclear industry is extremely important. By the year 2000, about 200,000 [word indistinct] of processed and dangerous nuclear fuel will have built up in the world, of which only 25 percent may be reprocessed. Things are bad in this respect in the USSR, where every nuclear power station has its own store of processed fuel, which represents a potential danger. [passage omitted]

#### **Malyshev To Head Nuclear Safety Body**

*LD1407111989 Moscow Domestic Service in Russian  
0830 GMT 14 Jul 89*

[Andrey Nikoforov report from USSR Supreme Soviet session at the Kremlin]

[Text] The USSR Supreme Soviet session continues its work in the Kremlin today. At the morning session, candidates for the offices of chairmen of USSR state committees are being examined. Vadim Mikhaylovich Malyshev is first to be invited to the platform. He is being proposed for the office of chairman of the State Committee for the Supervision of Work Safety in Industry and Nuclear Power Engineering. Listen to a brief extract from his speech to the deputies.

[Begin Malyshev recording] The Union Republican State Committee for the Supervision of Work Safety in Industry and Nuclear Power Engineering [gospromatomnadzor], which was created through the amalgamation of two state committees, is called upon to ensure the safe utilization of technology. It is not only a new body that is being created; a state system of supervision over the safety of production facilities must be created. A system

of protective measures must be created, not a fire brigade! The duties of the committee, and its juridical responsibility, which should be sealed by corresponding acts of legislation, are, first and foremost, ensuring the safety of the population, the safety of personnel and the purity of the environment. [end recording]

Vadim Mikhaylovich Malyshev also spoke about the need for the complete independence of the committee from other ministries and departments to be sealed by legislation, the imposition of severe economic sanctions for the most crude violations of technological discipline, and the all-around broadening of glasnost in discussing questions of the siting of industrial and power-engineering projects and the safety of their construction and production. Comrade Malyshev replied to numerous questions from deputies and the majority of them concerned questions of safety in the field of nuclear power engineering. Here is one of these questions and the response to it:

[Begin Malyshev recording] Deputy Vladimir Ivanovich Kolesnikov, from Rostov-on-Don asks this question: Which doctrine do you adhere to on the functioning of nuclear power stations—the principle of reasonable sufficiency or complete safety? Comrades, of course, all of us stick to the principle of complete safety. But, unfortunately, at the present time scientific-technical knowledge still does not permit guaranteed safety to be provided in complex production processes. Throughout the world—and this movement began 10-15 years ago—there exist quantitative criteria on safety assessment. Our scientists and engineers, and the supervisory bodies, have lagged behind this, and only now has the question been posed that over the course of 2-3 years these quantitative criteria for existing stations have been determined. And as far as newly projected stations are concerned, from 1991 projects will be examined by the gospromatomnadzor only in the event of such analyses being presented. But there is another serious question to be faced. The fact is that we must carry out a great deal of educative work to ensure that the public, the population, realises what are the quantitatively acceptable and unacceptable criteria. [end recording]

Deputies Shcherbak, Borovkov, and (Karasilnikov) took part in the debates on Comrade Malyshev's candidature.

I would like to present for your attention an extract from Deputy Shcherbak's speech:

[Begin Shcherbak recording] What are the reasons, why is it that precisely now, today, that in our country it is not only nuclear power stations, submarines, factories, and trains that are going up in flames, so is the system, which has absorbed on the one hand industrial and power systems of unprecedented capacities and projects of the end of the 20th century, and on the other hand an unprecedented slump in labor and technological morale which has reached a critical level. That is why the gospromatomnadzor, which is now being created, will be at the baptism of the most intricate and painful problems of the development of our society. Imparting the committee with the status of independence is one of the crucial and strategic tasks, and you and I, comrade deputies, are the ones to do this. The committee must be retrieved from those branches which are under surveillance and its decisions must not be rescinded by ministries and departments. The philosophy of safety and its theoretical and experimental foundations must be the basis of the committee's work. I think it would be expedient to set up within the committee a special scientific-research institute which could in theory be called an Institute of the Science of Catastrophes [institut Katastrofologiyi] in which possible disaster situations could be examined and simulated. It is very important that, with the amalgamation of two different structures—the gosgortekhnadzor and the gosatomenergonadzor—a technically unmanageable conglomerate does not emerge.

Esteemed Vadim Mikhaylovic, the supreme body of power is today handing you the keys to the safety of our country's power industry. Much depends on you and your committee to ensure that the wormwood star [reference to part of Book of Revelations] does not threaten life on earth. [end recording]

According to the results of the voting, Vadim Mikhaylovich Malyshev was appointed chairman of the State Committee. The deputies then turned to discussing the candidature of Vladimir Aleksandrovich Kryuchkov to the office of the chairman of the USSR State Security Committee.



## CANADA

### **AECB Head: Nuclear Watchdog Lacks Resources To Do Job**

51200027 Ottawa *THE OTTAWA CITIZEN* in English  
2 Jun 89 pp A1-A2

[Article by Nicole Baer]

[Text] A deadly safety flaw in a Canadian nuclear reactor could go undetected because the industry's watchdog doesn't have the resources to do its job.

"I don't think you should clutch your heart and say we're going to blow up tomorrow," said Dr Rene Levesque, head of the Atomic Energy Control Board. "But unless we do something soon...I think there is a real danger that something could happen."

Levesque said the AECB needs more money and staff to routinely inspect safety systems and properly analyse industry proposals for new power plants.

"We're there to correct things as we go along. But there's more chance of things going wrong if you don't have the people to do the routine checks."

Only one of AECB's 275 professionals looks after proper training and practices of hundreds of plant operations, said Levesque, a nuclear physicist and head of the organization for 1-1/2 years.

Yet it was human error that caused the two biggest nuclear disasters in history, at Three Mile Island in Harrisburg, Pa., and Chernobyl in the Soviet Union.

Levesque also noted the AECB, established in 1946, is only now developing a comprehensive plan to respond to a major nuclear accident.

Noting a parliamentary committee and a study on Ontario's nuclear industry have pointed out the AECB's shortcomings in the past, Levesque argues the issue is public confidence in the industry.

He wants at least 200 more staff members to bring the board on par with Swedish, French and British regulatory agencies. The U.S. regulatory body has four times the personnel strength of the AECB on a per-reactor basis.

Levesque said the board, a Crown corporation that reports to Parliament through the energy minister, may charge the nuclear industry for licences to recover much of its \$24-million-a-year costs.

Federal Energy Minister Jake Epp said Thursday he thinks the industry is "as safe as humanly and technically possible." But he added if the AECB can convince him it needs more resources to improve safety, he will try to convince his cabinet colleagues to consider the demand as part of his planned industry restructuring.

Under that restructuring plan, additional money and staff could come from beneficiaries of nuclear technology such as

utilities, provincial governments, universities, hospitals, and the private sector, Epp said in an interview. The AECB should not look to the federal government for more resources, he added.

With four new plants under construction and up to six more proposed for the 1990s, the issue of safety and health risks will remain as controversial as always.

Most experts agree the CANDU technology, developed in Canada to use regular uranium and heavy water, has an excellent safety record under normal operation.

Ontario Hydro says there have been no deaths among workers at any of its nuclear plants since it got into the business in 1955.

Yet accidents happen.

In 1952, there was a dramatic meltdown in an experimental reactor in Chalk River. High levels of radioactive materials escaped, but Canada's nuclear agency, Atomic Energy of Canada Ltd., says no one was killed.

Defective pressure tubes in the intensely radioactive cores of the Bruce and Pickering nuclear generators have ruptured and leaked. The leaks were contained, and Hydro says clean-up crews were sent in only for short stints to limit their radiation exposure.

Foes of nuclear energy say the industry's reassuring words are wasted because the remotest chance of nuclear catastrophe is too much.

Of more concern to some are the long-term effects of low-level radiation around power plants and uranium mines.

A recent AECB study found more cases of leukemia than normal among children living near some Ontario nuclear plants. There were 3.5 times the number of leukemia deaths among children born near the Bruce Nuclear Power Development on Lake Huron than expected in a normal population.

But the study found fewer than expected incidents of leukemia around the Chalk River Nuclear Laboratories.

The AECB has ordered a second study because the number of children involved was too small for convincing analysis.

## FEDERAL REPUBLIC OF GERMANY

### **Opposition Party Attacks FRG-Brazilian Nuclear Cooperation**

**Accusations of Government Complicity**  
51003012 Munich *SUEDDEUTSCHE ZEITUNG* in German  
20 Jul 89 p 2

[Article by Stephan-Andreas Casdorff: "SPD Accuses Government of a 'Crime'"; first paragraph is *SUEDDEUTSCHE ZEITUNG* introduction]

[Text] Brazil withdraws German nuclear technology from international control. Bonn evidently informed



about Brazil's treaty violation for months. Revocation of export permits demanded.

Bonn, 19 July—Contrary to its denials, the government has evidently known for months that Brazil, in violation of its treaty obligations, has withdrawn nuclear technology which was supplied by Germany from international control. This technology can be used in the production of nuclear weapons. Hermann Scheer, an SPD [Social Democratic Party of Germany] Bundestag deputy, has numerous documents to this effect, including the minutes of a discussion in the Federal Economics Ministry on 15 November.

The minutes of this meeting show that as early as last year the question was raised as to whether export permits "related to the construction of a uranium enrichment facility using the jet-nozzle process" could in the future still be granted. This could be "dubious," because the project which had been negotiated with the FRG could potentially "be transferred to the independent Brazilian enrichment program, which is not under IAEA [International Atomic Energy Agency] control." The question as to whether or not "previously issued export permits could be revoked" was also discussed.

Since all of the individual contracts were interrelated and, from the political point of view, dependent on one another, it was felt that the problems which resulted from the reorganization of the Brazilian nuclear industry had to be handled "with extreme caution."

In response to an inquiry, Scheer explained that halting the issuing of all export permits for uranium enrichment facilities would have endangered the shipment of components for the two nuclear power plants which are currently under construction. The issuing of the permits was not stopped, even though safeguard monitoring was no longer certain. Based on this, Scheer concluded that the government gave precedence to business interests over the prevention of nuclear weapons proliferation.

Article III, Section 2 of the Nuclear Non-Proliferation Treaty obligates every signatory country "not to provide: (a) source or special fissionable material, or (b) equipment or material especially designed or prepared for the processing, use or production of special fissionable material, to any non-nuclear-weapon state for peaceful purposes, unless the source or special fissionable material shall be subject to the safeguards required by this article." With reference to this article, Social Democrat Scheer believes that the government is willingly accepting a "weakening" of the treaty. The government is thus responsible for "an incredible event which is more than a national scandal. Active toleration of nuclear weapons proliferation is an international crime."

Scheer has refused to retract his statement. "What else is it then? I only called this activity by its true name," he stated. He pointed out the interrelationships between the individual projects. As early as 1974, in a confidential document—also in Scheer's possession—the jet-nozzle project was evaluated as being of decisive importance for

German-Brazilian cooperation. If the government had prohibited this project, then Brazil would have had no interest in further cooperation. In 1977, Bonn was only able to placate the U.S., which had complained bitterly, by placing all facilities to be supplied under IAEA supervision. This supervision was the "sole legitimation for the program," since has not signed the Nuclear Non-Proliferation Treaty. Last year, the current government "did not dare to take action based on the ending of supervision, so as not to endanger the civilian project." The government is dominated by its "moneybags mentality, even when the most delicate problems of international security are at stake," said Scheer. It continues to permit the exportation of nuclear technology, even though Brazil is pursuing a military nuclear program.

In Scheer's opinion, "immediate action is necessary." At the very least, previously issued export permits should be immediately revoked, and the export of all technologies which can support the production of nuclear weapons should be stopped, namely uranium enrichment and fuel-element reprocessing technologies. The SPD politician considers it "particularly significant" that Foreign Minister Hans-Dietrich Genscher (FDP [Free Democratic Party]) has so far remained silent. Scheer also has the minutes of a meeting on 27 October 1987 which show that the Foreign Ministry even then pointed out "increased Brazilian efforts to develop and independent (thus military) nuclear program."

Scheer stated that there had been efforts to persuade the Brazilian government to abide by the safeguard monitoring provisions of the mutual nuclear agreement. In spite of this, Brazil ignored these obligations by deciding to combine its military and civilian programs in September 1988. "The government cannot have been ignorant of this. This is further proof that it bears full responsibility for the violation of the Nuclear Non-Proliferation Treaty. The credibility of the government's arms control policy is now at stake. Scheer stated that if the government continues to try to avoid taking responsibility by remaining silent, it will become "unavoidable" that parliamentary committees, at least the foreign affairs and commerce committees, be reconvened "before that end of the summer break."

#### **Sanctions Against Brazil Demanded**

51003012 Frankfurt FRANKFURTER ALLGEMEINE ZEITUNG in German 22 Jul 89 p 4

[Article by K.B.: "The SPD Demands Steps Against Brazil. Supplies of Nuclear Technology Should Be Stopped. 'Rumors.'"]

Bonn, 21 July—The SPD members of the Bundestag believe that there is an increasing danger that the FRG could violate the Nuclear Non-Proliferation Treaty in cooperation with Brazil. The deputies Scheer and Bachmaier stated on Friday that a new situation has arisen for the German-Brazilian treaty signed by the Schmidt government. This program for the peaceful use of nuclear energy has been joined since September 1988 with a

Brazilian program which, according to the government in Brasilia, is aimed at the testing of an atomic bomb. The safeguard monitoring by the International Atomic Energy Agency, which had been agreed upon, has, according to Scheer and Bachmaier, been evaded. The signing of the treaty had been made dependent on safeguard monitoring by the international agency. This has now been undermined.

The SPD is demanding immediate measures which would be tantamount to a partial revocation of the treaty. Further deliveries of so-called sensitive nuclear technology, which could be used for nuclear weapons, should be halted. Existing export permits should be revoked. The training of Brazilian nuclear personnel should be ended. In the event that it is determined that sensitive nuclear technology from the FRG and German-trained nuclear personnel have been used for military purposes, then Bonn will have to renounce the treaty. This is necessary, if non-proliferation policy is to remain credible. The SPD Bundestag members demand that all exports of nuclear technology and materials as well as all training programs be immediately suspended for countries which have not signed the Nuclear Non-Proliferation Treaty.

According to Government Spokesman Klein, the government has no evidence that the German-Brazilian treaty has been violated. German nuclear technology in Brazil is, as was agreed upon in 1975, subject to monitoring by the International Atomic Energy Agency. The SPD is demanding major decisions from the government based on a few rumors.

The central question in this growing dispute between the government and the opposition is whether or not sensitive uranium enrichment and reprocessing technology, which can be used in the production of nuclear weapons, has been supplied. The Siemens Group, which is involved both through the Power Plant Consortium [Kraftwerkunion, KWU] as reactor builder and through the Siemens subsidiary, Interatom, has also stated that it has no evidence of treaty violations by the Brazilians.

According to Siemens-Kraftwerkunion, the first stage of a demonstration model of a jet-nozzle enrichment facility has been delivered by Interatom in cooperation with Steag AG. In addition, there is a laboratory facility in Brazil which was supplied by the Karlsruhe Nuclear Research Center. It is claimed that this is a test facility which could not be used for enrichment. Siemens-Kraftwerkunion states that even when the demonstration unit is finished, it will not provide an economically or militarily relevant enrichment capacity. No decisions have been made about expanding the already supplied first construction stage. According to the government, the previously planned delivery of a reprocessing unit has not taken place.

Bachmaier and Scheer, however, find it dangerous that Brazil has already been given technical knowledge about

uranium enrichment and reprocessing. Even if the jet-nozzle unit could only achieve enrichment to the one percent level, the enrichment could be increased in Brazil by other means.

Based on internal documents, which the Nuclear Investigating Committee of Bundestag has acquired, the SPD deputies accuse the government of having failed to inform the responsible committees. The 1988 decree of the Brazilian president means that the German-Brazilian civilian agreement has been merged with an independent Brazilian nuclear program. Brasilia has unilaterally dissolved a company for the construction and management of a uranium enrichment facility in which Interatom and Steag were said to be involved. Bonn has allegedly known this since the autumn of 1988 at the latest. Brazil's obligation to report this to the International Atomic Energy Agency was not fulfilled. In Scheer's view, for the first time a situation has occurred in which the FRG government is informed about insufficient safeguard monitoring and yet has not lived up to its duties as a nonproliferation treaty signatory.

## FINLAND

### CERN Seeks Full Finnish Membership

51002430 Helsinki HELSINGIN SANOMAT in Finnish  
18 May 89 p 9

[Article: "CERN Users' Chairman: 'CERN-Finland Relationship Cannot Continue on Present Basis'"]

[Text] The chairman of the European Center for Nuclear Research (CERN) users organization, Norwegian Prof Egil Lillestol, is concerned over Finland's future in CERN. According to him, CERN members would like to see Finland a member of CERN, but the present relationship cannot, as he sees it, continue.

Lillestol regards as impossible the idea that we can go on this way since we have managed very well up to now.

"Spain and Portugal have joined us. We no longer understand why Finland is participating without being a member," Lillestol called attention to the fact on Wednesday.

Lillestol discussed Finland's membership on Wednesday with Markku Linna, the head of the Education Ministry's College and Science Department. Lillestol said that he had gotten the impression that the Education Ministry feels that full membership is indispensable as far as science is concerned.

On Wednesday, however, Linna asserted that it would be detrimental to Finland if it were to be excluded from CERN research because it had refused full membership.

As far as is known, the Foreign Ministry and the Trade and Industry Ministry do not consider joining to be indispensable. Joining will now be considered by the Education Ministry, and, after that, the government will

deal with the matter. Lillestol said that Finland's membership would in any event be raised at the CERN meeting in June.

#### **New Accelerator in Operation This Summer**

It is urgent that the question of Finland's membership be resolved, according to Lillestol, because CERN is beginning to be too much in demand.

CERN's new 27-km-long circular particle accelerator is to go into operation this summer. With the accelerator they plan to study the smallest elements of matter by accelerating matter and "antimatter" particles and getting them to collide with one another. According to the researchers, through acceleration they are able to study the birth of the universe by simulating a situation that corresponds to the situation that existed only a billionth of a second after the birth of the universe.

The new accelerator has already brought together nearly 6,000 scientists at CERN, and their number is still growing.

#### **Finland Could Join by Degrees**

Finland's membership would cost about 40 million markkas a year. However, Finland could, according to Lillestol, agree to a membership program in terms of which its dues would gradually rise.

According to Lillestol, CERN is no longer accepting new members, with one exception—Finland. "It's not so much Finland's money that we need as it is Finnish scientists," he said.

According to Lillestol, Finnish scientists have performed valuable services at CERN. Lillestol stressed the fact that they will still be participating for years in projects that are now in progress, but, if Finland does not become a member, in a few years time the situation will change.

Lillestol emphasized that Finnish industry could benefit from Finnish membership in CERN. He said that in his native land, Norway, industry has achieved notable accomplishments thanks to Norway's membership.

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